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POPULAR MECHANICS MAGAZINE

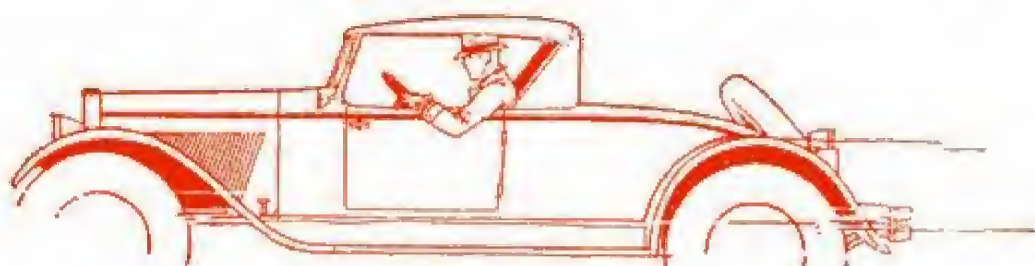
WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK, U.S. PAT. NO. 2,054,225

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SEE PAGE 938

Fast drivers: Oil which lasts longest at high speed, lubricates best!



Thousands of miles of speedway tests have shown that the New Mobiloil stands up better and lasts longer at high speeds than other oils. So we can confidently say: The New Mobiloil can keep the first-year feel in *your* engine for at least 30,000 miles.

Make this chart your guide

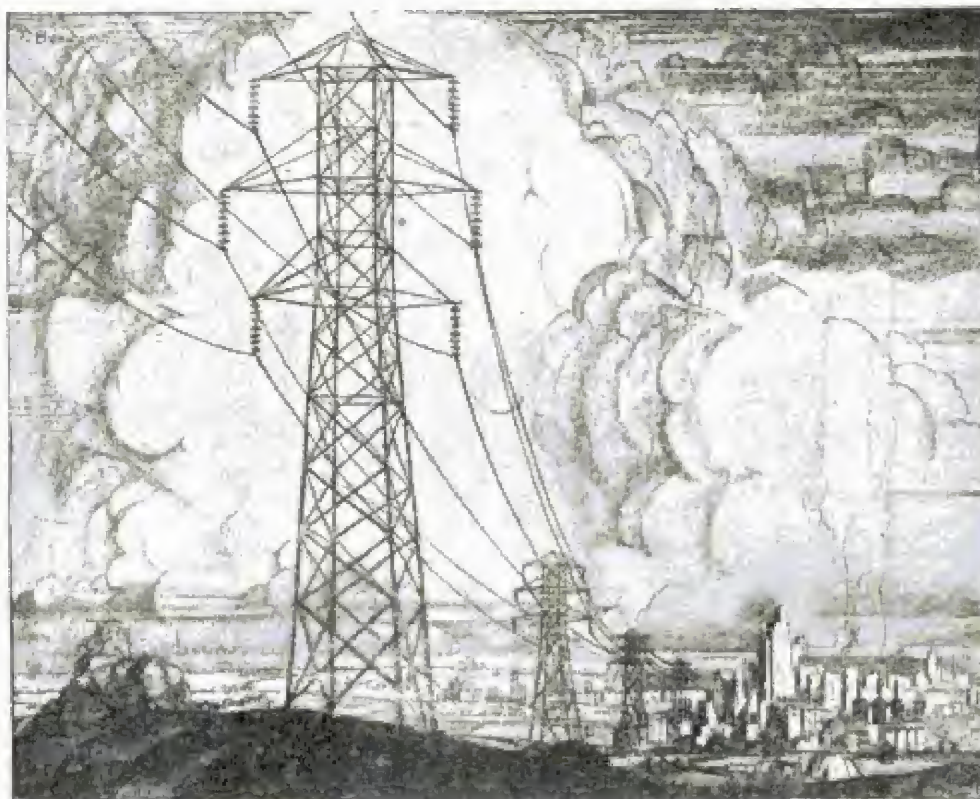
It shows the correct grade of Gargyle Mobiloil for certain prominent cars. If your car is not listed below, see complete Mobiloil Chart at your Mobiloil dealer's.

NAMES OF PASSENGER CARS	1926		1928		1927		1926	
	Engine	Engine	Engine	Engine	Engine	Engine	Engine	Engine
Auburn, 6-66	BB	Arc	BB	Arc	BB	Arc	A	A
" 8-cyl	A	Arc	A	Arc	A	Arc	A	A
" other models	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Buick	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Cadillac	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Chandler Special Six	A	Arc	A	Arc	A	Arc	A	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
Chevrolet	A	Arc	A	Arc	A	Arc	A	Arc
Chrysler, 6-cyl	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" Imperial	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
De Soto	A	Arc	A	Arc	A	Arc	A	Arc
Dodge Brothers	A	Arc	A	Arc	A	Arc	A	Arc
Dumont	A	Arc	A	Arc	A	Arc	A	Arc
Edsall	A	Arc	A	Arc	A	Arc	A	Arc
Ford, Model A	A	Arc	A	Arc	A	Arc	A	Arc
" Model T	A	Arc	A	Arc	A	Arc	A	Arc
Franklin	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Gardner, 8-cyl	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" other models	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Graham-Paige	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Hudson	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Hupmobile	BB	Arc	BB	Arc	BB	Arc	BB	Arc
La Salle	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Maxwell, 8-cyl	A	Arc	A	Arc	A	Arc	A	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
Moore	A	Arc	A	Arc	A	Arc	A	Arc
Nash, Adv. & Sp. 6	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
Oakland	A	Arc	A	Arc	A	Arc	A	Arc
Packard	A	Arc	A	Arc	A	Arc	A	Arc
Pontiac, 72, 90, 91	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
Plymouth	A	Arc	A	Arc	A	Arc	A	Arc
Reo	A	Arc	A	Arc	A	Arc	A	Arc
Stearns Knight, 8-80	BB	Arc	BB	Arc	BB	Arc	BB	Arc
" other models	A	Arc	A	Arc	A	Arc	A	Arc
Studebaker	BB	Arc	BB	Arc	BB	Arc	BB	Arc
Vaux, 8-cyl	A	Arc	A	Arc	A	Arc	A	Arc

the New



Mobiloil



ELECTRICITY—*the lifeblood* of America's industrial expansion

ELECTRICITY is steadily remaking American industry in terms of faster, better, more accurate, and more economical production.

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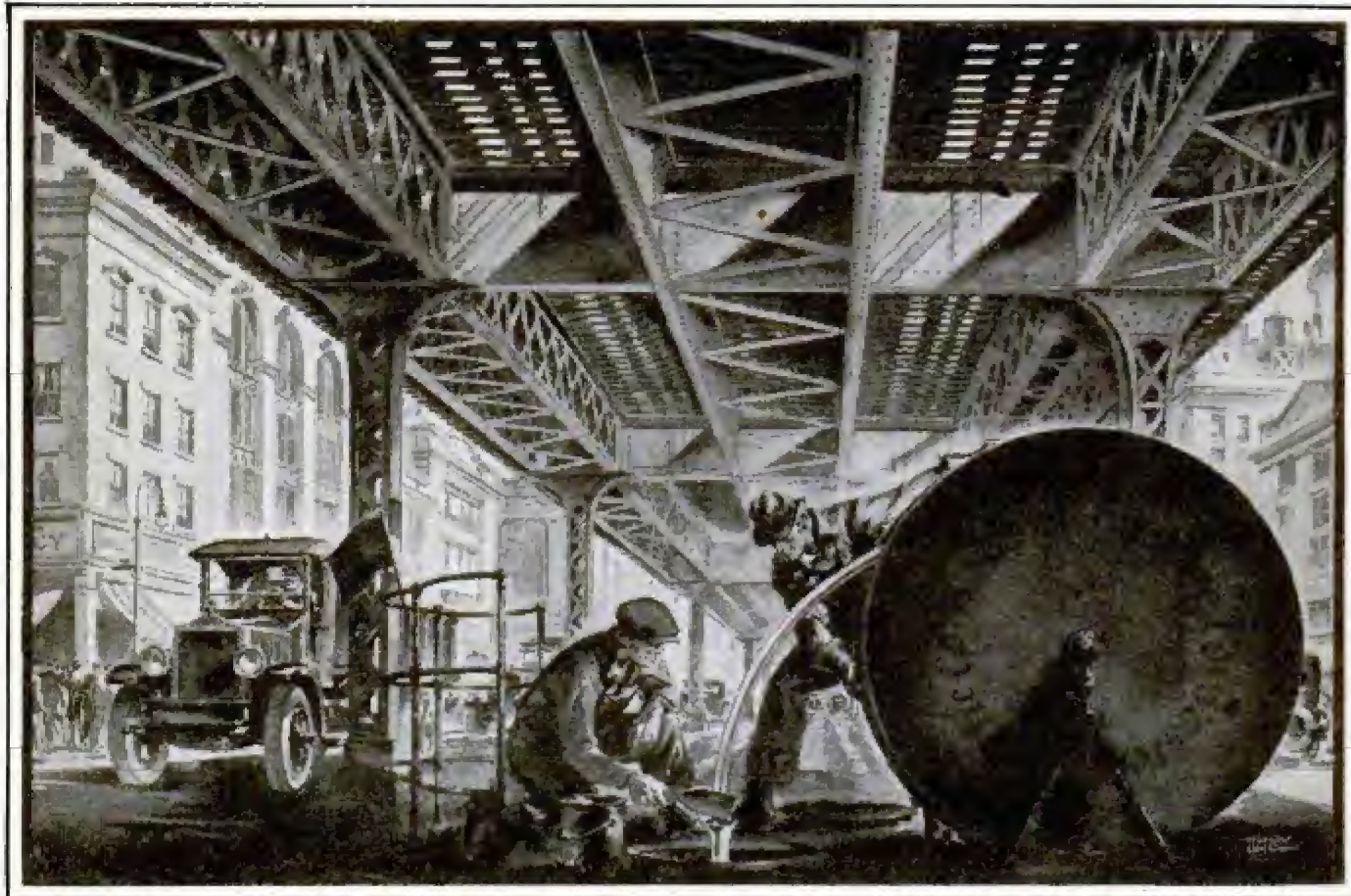
It is also significant that the electrification of industry, already 70 per cent complete, has made its greatest progress in the plants whose policies are guided by accurate cost-accounting methods—and that these plants have grown and prospered.



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at 100 old P.M.C.

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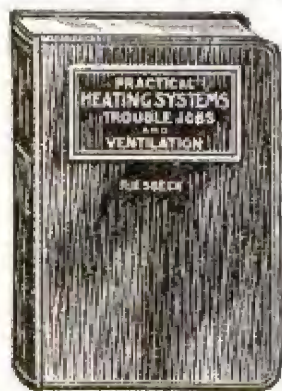
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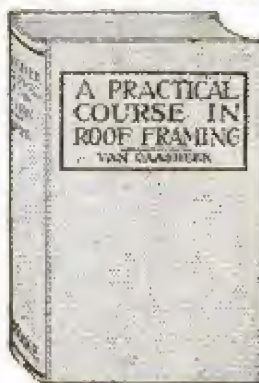
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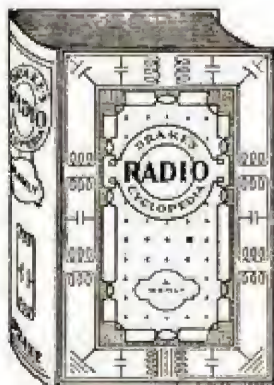
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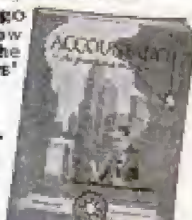
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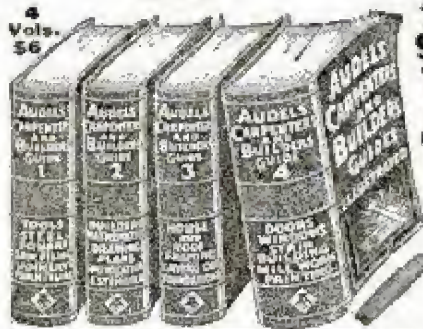
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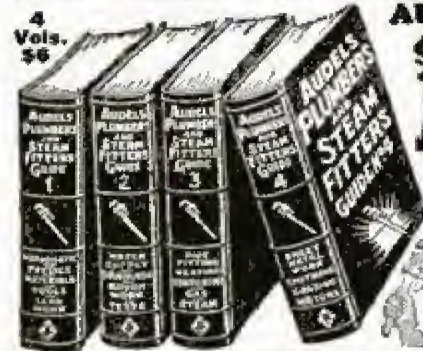
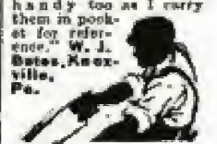
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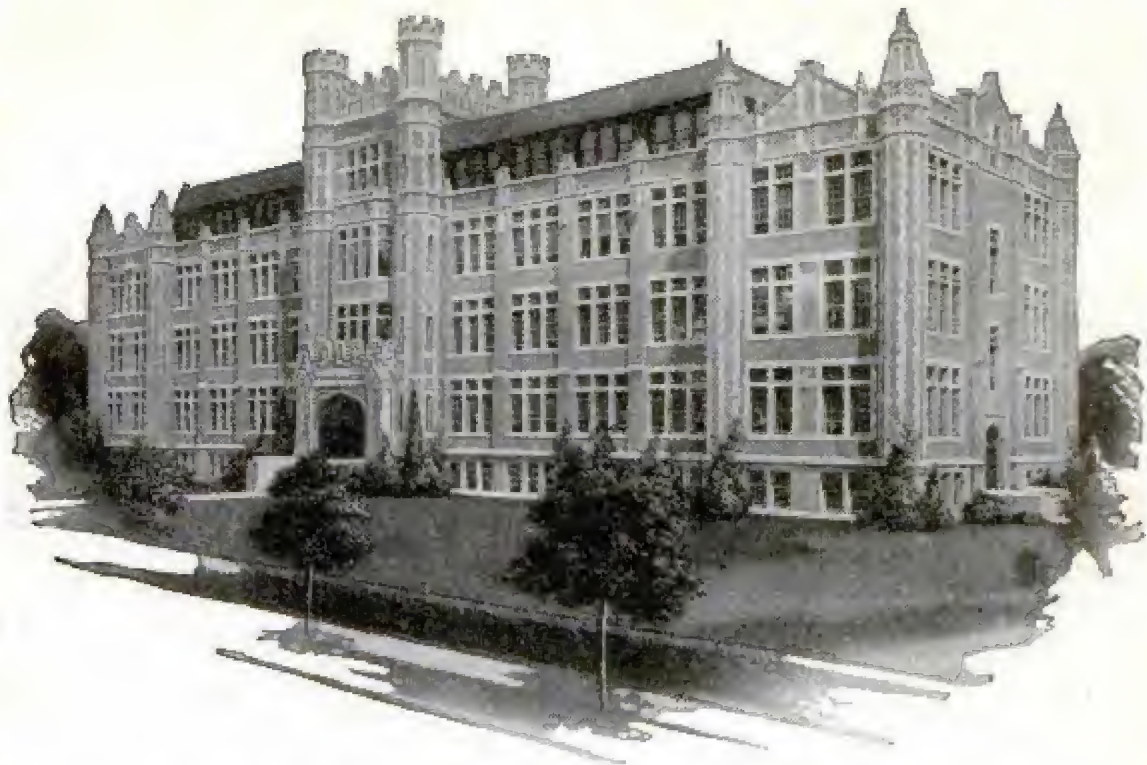
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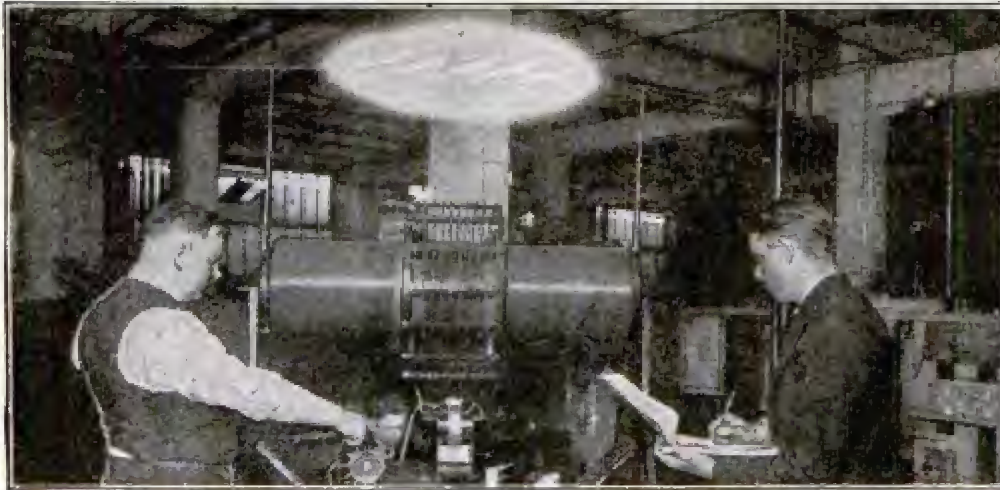
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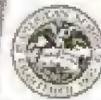
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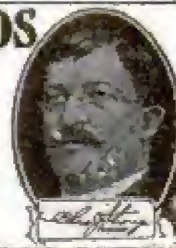
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and I offered something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. Tomorrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy, the kind that fire you with ambition and the courage to tackle anything set before you.

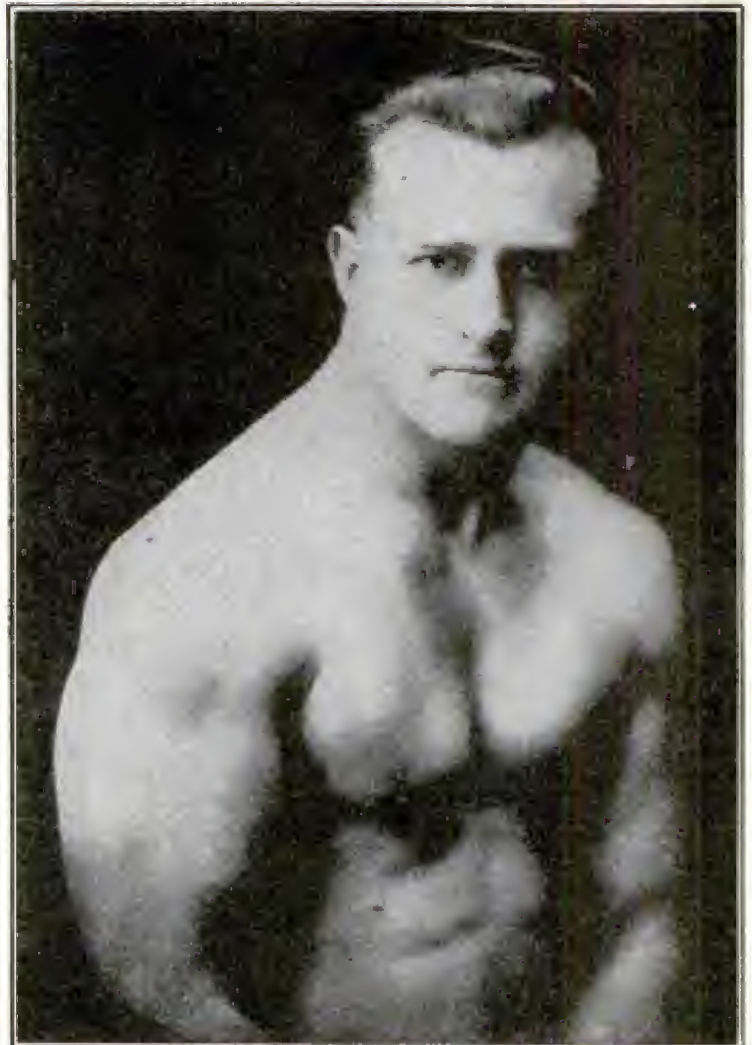
ALL I ASK IS NINETY DAYS

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile I'm putting life and pep into your old back-bone. And from then on, just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real work. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A REAL MAN

When I'm through with you you're a real man. The kind that can prove it. You will be able to do things you had thought impossible. And the beauty of it is you keep on going. Your deep, full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge square shoulders and your massive muscular arms have that craving for the exercise of a regular he-man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life for you.



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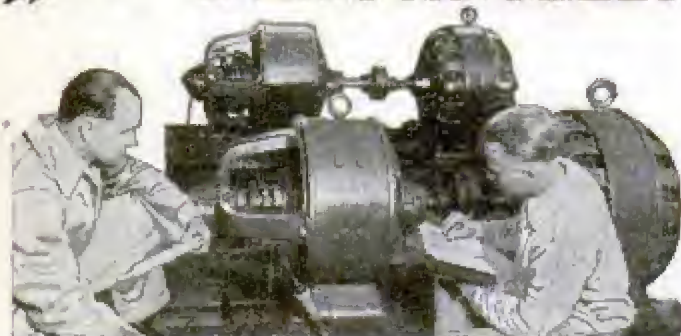
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* Based on the combined experiences of F. B. Englehardt, Chattanooga, Tenn., A. F. Thompson, Sioux City, Iowa, B. F. Boilon, Columbus, Ohio, and many others.



Caught in a Rut

I wonder I put up with it as long as I did! Every day was filled with nothing but deadly routine and monotonous detail. No freedom or independence. No chance to get out and meet people, travel, nor have interesting experiences. I was just like a cog in a big machine with poor prospects of ever being anything more.



Long, Tiresome Hours

Every hour of the day I was under somebody's supervision. The **TIME-CLOCK** constantly laid in wait for me—a monument to unfulfilled hopes and dying ambition. Four times a day, promptly on the dot, it hurled its silent challenge at my self-respect, reminding me how unimportant I was and how little I really **COUNTED** in the business and social world!



Low Pay

Paid just enough to keep going—but never enough to enjoy any of the **GOOD** things of life every man **DESERVES** for his family and himself. Always economizing and pinching pennies. Always wondering what I would do if I were laid off or lost my job. Always uncertain and apprehensive of the future.



Desperate

Happened to get a look at the payroll one day and was astonished to see what big salaries went to the sales force. Found that salesman Brown made \$200 a week—and Jenkins \$275! Would have given my right arm to make money that fast, but never dreamed I had any "gift" for salesmanship.



A Ray of Light

Stumbled across an article on salesmanship in a magazine that evening. Was surprised to discover that salesmen were made and not "born" as I had foolishly believed. Read about a former cowpuncher, Wm. Short of California, making \$525 in one week after learning the ins-and-outs of scientific salesmanship. Decided that if **HE** could do it, so could I!



The Turning Point

My first step was to write for a certain little book which a famous business genius has called "**THE MOST AMAZING BOOK EVER PRINTED**". It wasn't a very big book, but it certainly opened my eyes to things I had never dreamed of—and proved the turning point of my entire career!

What I Discovered



Between the pages of this remarkable volume, I discovered hundreds of little known facts and secrets that revealed the **REAL TRUTH** about the science of selling! It wasn't a bit as I had imagined. I found out that it was governed by simple rules and laws that almost **ANY** man can master as easily as he learned the alphabet. I even learned how to go about getting into this "highest paid of all professions". I found out exactly how Mark Barchevich of San Francisco was enabled to quit his \$8 a week job as a restaurant-worker and start making \$125 a week as a salesman; and how C. W. Birmingham of Dayton, Ohio, jumped from \$15 a week to \$7500 a year—these and **hundreds** of others! It certainly was a revelation!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, Mr. Greenslade (the president) found me over a dozen good openings to choose from—and I selected one which paid me over \$70 a week to start!



Employment Service

Furthermore, I discovered that the National Salesmen's Training Association, which published the book, also operates a most effective employment service! Last year they received requests from all over the U. S. and Canada for more than 50,000 salesmen trained by their method. This service is **FREE** to both members and employers and thousands have secured positions this way!



Making Good At Last!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, Mr. Greenslade (the president) found me over a dozen good openings to choose from—and I selected one which paid me over \$70 a week to start!



Was It Worth It?

Today my salary is \$4800 greater than ever before! No more punching time-clocks or worrying over dimes and quarters! **NOW** my services are in **REAL DEMAND** with bigger prospects for the future than I ever dared **HOPE** for back in those days when I was just another "name" on a pay-roll!



Get Your Copy **FREE**

Right now the book—"The Secrets of Modern Dynamic Salesmanship"—which banished all my fears and troubles and showed me how to get started on the road to success and independence—will be mailed as a gift to any ambitious man absolutely **FREE**. And since there is no obligation, why not see for yourself what amazing facts it contains! Just mail the coupon now—for there is no better way in the world to invest a 2-cent stamp! **I KNOW!**

National Salesmen's Training Assn., Dept. G-101, N. S. T. A. Bldg., Chicago, Ill.

Without obligation, please send me a free copy of "The Secrets of Modern Dynamic Salesmanship."

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Age.....Occupation.....

5 Easy Ways to Make \$3.00 an hour in Your Spare Time in RADIO

Each of these plans, developed by the Radio Training Association of America, is a big money-maker. Set owners everywhere want to get rid of static, to have their sets operate from the electric light socket, the tone improved, and the volume increased, and transformed into single-dial controls. Phonograph owners want their machines electrified and radiofied. If you learn to render these services, you can easily make \$3.00 an hour for your spare time, to say nothing of the money you can make installing, servicing, repairing, building radio sets, and selling supplies.

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prepare you at home—in your spare hours, to be a successful air man. Let me give you in a few short months the store of practical aviation experience it took me many years to get. Let me prepare you for one of the thousands of big pay jobs. With my training, many men are now earning three and four times their former incomes. You can do the same. I'll not only train you at home—I'll also help you find the job you want after you graduate. Aviation is the game red-blooded fellows are flocking into. It is growing faster than the automobile or radio industry. Now—on the threshold of aviation's greatest development—is the time for YOU to act. Rush the coupon to me for FREE copy of my famous book. Every page will thrill you.

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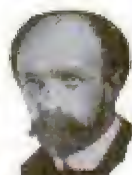
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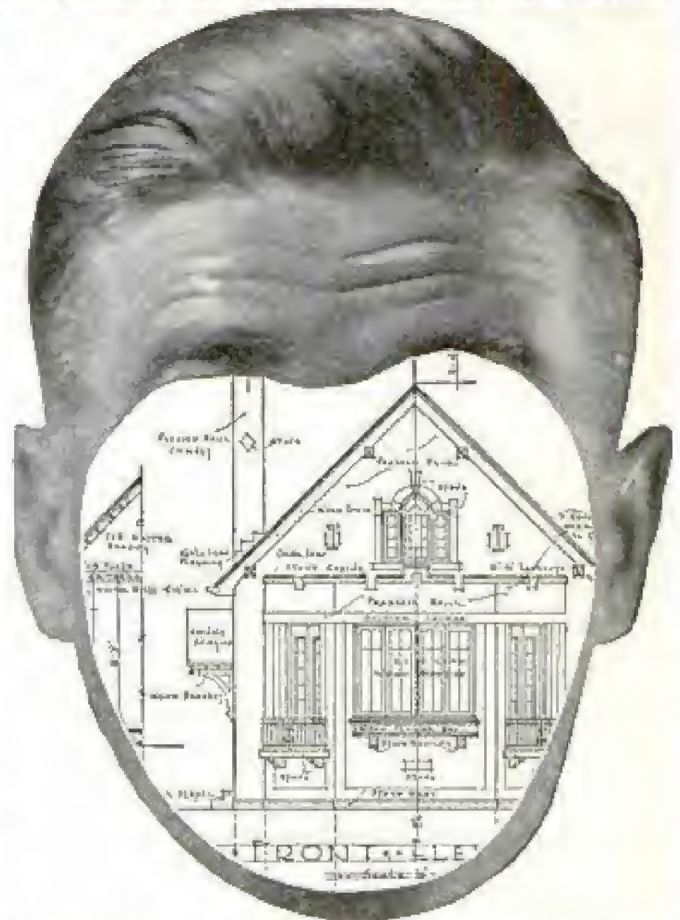
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"He was trying to figure out a way to speed up the machines. I could see he was stumped and I asked him if he would let me try my hand at it.

"Go ahead," he said, "but I don't believe you can help much. Looks like an outside job to me."

"So I started right in and pretty soon I had the whole thing worked out. The boss was watching me and I could see he was surprised.

"How did you learn all that?" he asked in that quiet way of his. And then I told him I'd been studying at home nights through the International Correspondence Schools.

"He didn't say anything more and I thought he had forgotten all about it until he called me in his office a few weeks later and said he was going to make me foreman and increase my salary \$75 a month.

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| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> English |
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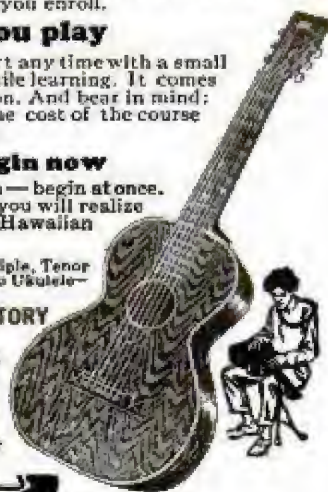
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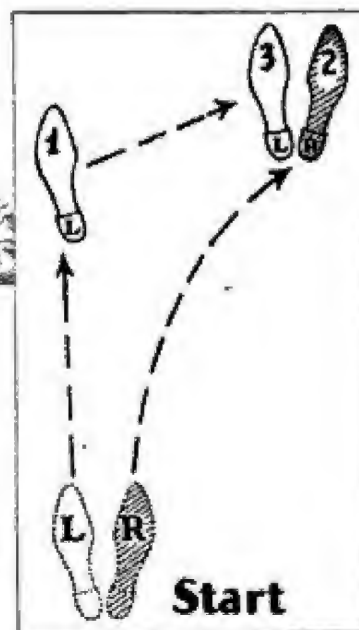
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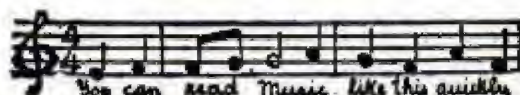
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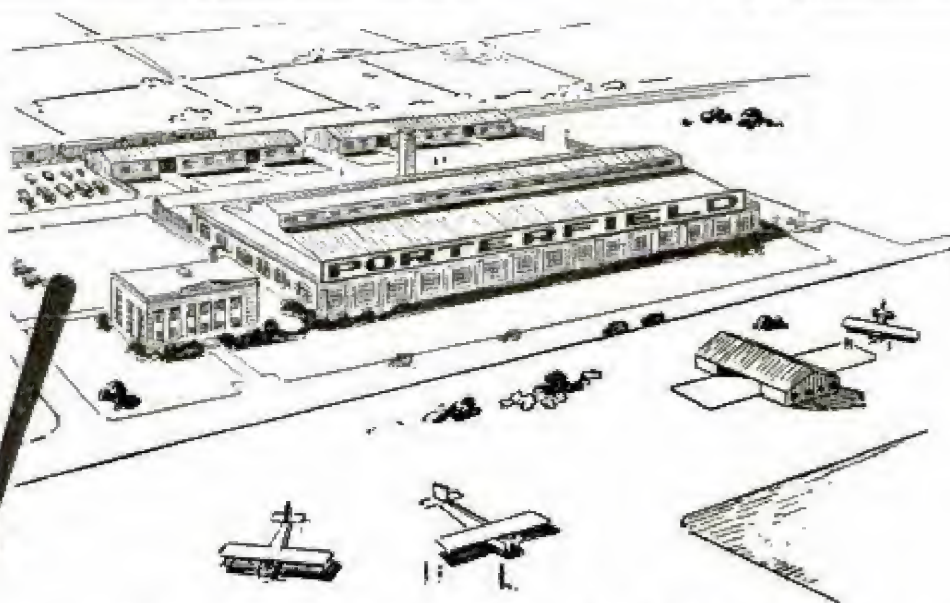
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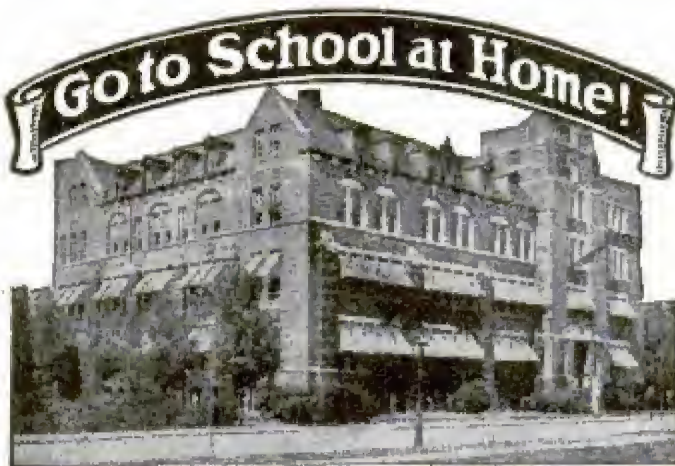
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"But Bob . . ."

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That very night we were all invited to the Carews' party. On the way over, I sensed a big difference in Helen—a difference that made my heart beat fast with a new hope.

I Am Asked to Play the Piano

A little later in the evening we were all gathered around the piano, listening to the rather indifferent performance of one of the guests.

"I've heard so much about your talent!" said Helen. "Won't you play something for us?"

"Yes!" "Yes!" "Please!" came from all sides.

With a smile I bowed low . . . and replied that it *would be a pleasure!*

Bob's grin changed to amazement. Calmly ignoring his frantic signals I walked over to the piano. Quick as a flash he followed me.



"For the love of Pete get away from that piano," he whispered excitedly. "Don't make a monkey of yourself. If Helen ever hears you play she'll think everything else I told her is bunk—too!"

Turning to the guests, Bob announced, "Perhaps we should wait until some other time. His wrist was slightly sprained in tennis this afternoon, and . . ."

"Oh, that's nothing!" I broke in, and without any further hesitation, I began the first notes of Irving Berlin's famous "Russian Lullaby"! The tantalizing, irresistible strains seemed to throw a spell over the guests. I forgot Bob's astonishment—forgot the glow of admiration in Helen's eyes. On and on I played—losing myself in my music—until thunderous applause shook the room.

That brought me to myself with a start. For the rest of the evening I was the lion of the party.

Bob could hardly restrain his curiosity until we were safely home.

"Why didn't you tell me you knew how to play? When did you learn?"

"You never asked whether I knew how to play," I countered.

"Of course not! Last summer you didn't know one note from another—how was I to guess you'd blossomed into an accomplished pianist overnight?"

"Not overnight, exactly!" I smiled. "Although it almost seemed that way! Remember that Free Demonstration Lesson in music I sent for last summer? Well, when it came and I saw how easy it was to learn without a teacher, I sent for the complete course. It's great! Why, almost before I knew it, I was playing simple tunes! I can play *anything* now . . ."

"So you really are an 'accomplished' pianist! The joke's on me, all right!"

"Oh, I wouldn't say 'accomplished'." I laughed. "But enough of a pianist to get a lot more fun out of life than I used to!"

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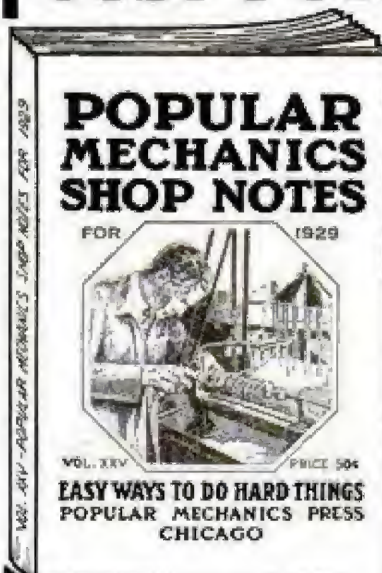
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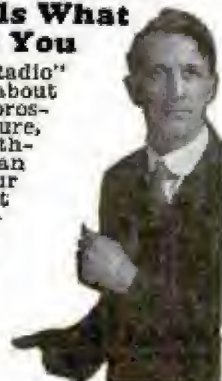
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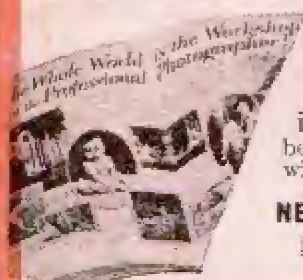
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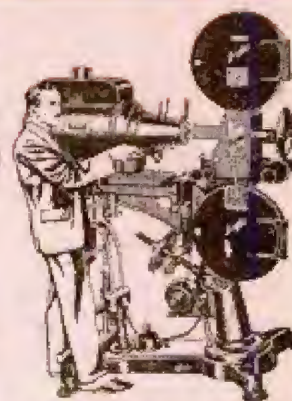
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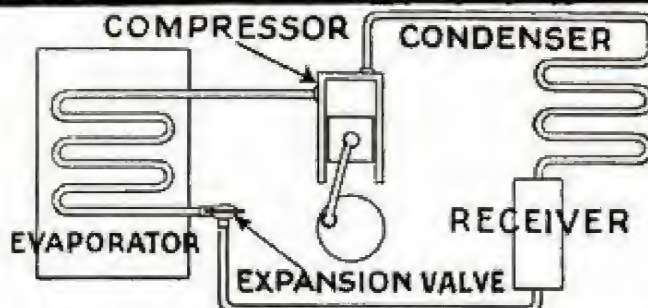
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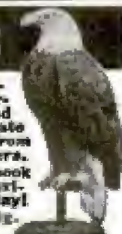
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We do not think it enough to send you an exerciser worth double what we ask, so for a limited time, we will also include instructions absolutely free. These instructions are interesting and simple to follow—they show you the short cut to health and strength. Order today before this wonderful offer is withdrawn.

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The Giant Chest Expander is sold with a guarantee that you will say it is the finest you ever saw or your money back.

5 Cables	or double	10 Cables
for	strength	for
\$2	The double strength exerciser has resistance of over 200 lbs.	\$4

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Sign your name and address to coupon below and get your Giant Expander at the present low introductory price by return mail. The price is made low because we want everyone to enjoy muscles and strength at the lowest possible cost. Don't pay more—order from us—get the most for your money. Use coupon now.

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Please send ☐ Your 10 cable Progressive,
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Check the Exerciser you want, and it will be sent you by return mail. Pay no money introductory price, plus low cents postage on arrival. It is understood that if you are not entirely satisfied with your exerciser you may return it within 5 days and get your money back.

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Street.....

City..... State.....

If you live outside the United States, send cash with order.

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RAILWAY
TRAFFIC
INSPECTION
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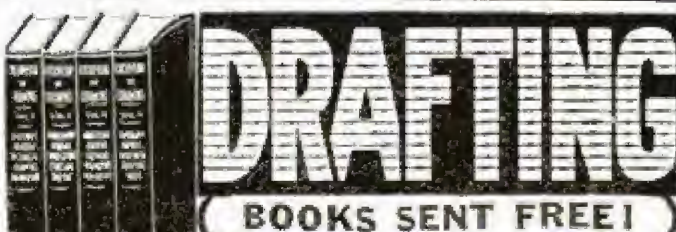
It pays from \$120 to \$250 per month salary plus expenses, to start. And the future offers unlimited opportunities. You travel or remain near home—are practically your own boss, reporting only to high railway officials. Hours are regular—work pleasant.

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Those are the words you will hear after a few weeks of spare time home instruction in Railway Traffic Inspection, for we will train you and upon completion, assist you to a position at a salary of \$120 per month or more, or refund your tuition. There's no hunting a job—no hard selling—no starvation period. And with experience, your salary rapidly increases to \$175, \$200, \$250 per month.

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Name.....

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Employed by.....

Address.....

Bald Men! Free

One Full Ampoule of my amazing Hairerbs fluid which I discovered myself and which grew hair on my head. This Ampoule is absolutely free. Don't send any money. There is no C.O.D. No charge whatever. All I want is an opportunity to show you how easily I grew hair on my own and hundreds of other men's heads. Merely mail coupon below for Free Ampoule.

Here is How I Used to Look

I was just as bald as this picture. It is a true photograph without any tampering or retouching. It is exactly like I used to look. Then look at the full head of hair I have in the picture on the left! As I have stated so often, I don't know whether I am the first man who discovered this great secret, but I do know I have it, that I grew my own hair and that I am growing hair on the heads of other men all the time.



Bald Men Grow Hair Quick!

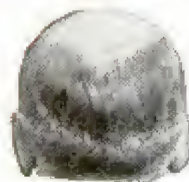
What I accomplished on my own head and on other heads I can do for you, provided you are under 45 years of age and loss of hair was not caused by burns or scars. Anyhow, I must succeed or you pay nothing. No apparatus. My home treatment is simple, quick, inexpensive.

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VREELAND

A-135 Euclid-Windsor Building
Cleveland, Ohio



Here is Brennan
Brennan while he was bald.
And Brennan after Vreeland
grew his hair. Write and I
will tell you Brennan's story
and give you his address.



Here is Wiseman
Wiseman was bald like this.
But Wiseman grew this head
of hair with my wonderful
Hairerbs fluid. All about
Wiseman and how he did it,
if you write. You will get
his address, too.



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same Wonderful Hairerbs Fluid which grew your hair.

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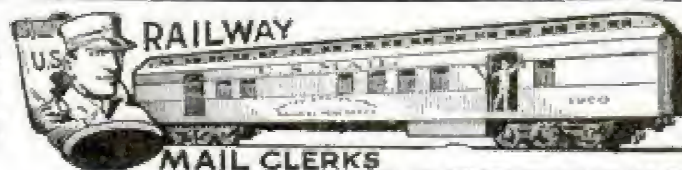
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Here's something that ought to make you sit up and take notice if you are lacking in energy, pep and staying powers. "Physical weakness is a crime"—many states say so when they require certain physical qualities in applicants for marriage licenses. "Physical weakness is a crime"—the United States Army and Navy say so when they put you through a rigid physical examination before enlistment. Big corporations say so, too, by insisting on higher physical standards in their employees. There is no place for you if you are a weakling!

If you are a nervous, timid, fidgeting, shambling fellow, you are not wanted anywhere—you don't attract men or women—you repel them. You can't indulge in the ordinary pleasures of life. You can't enter sporting contests—you lack the energy and stamina of the athlete. You don't get on in school or college—the fellows won't stand for your ailing and complaining, and your mental gloom. You can't hold down a good job—you are too languid and pepleless. Your outlook on life is marred by fits of the blues.

Nature exacts a terrible penalty when you've gone too far with her. She whips you into such a state of debility and despair that you become a miserable specimen of a man—an object to be pitied or shunned.

DON'T FOOL WITH DOPE AND DRUGS

Man, you won't get anywhere experimenting with drugs, dope and booze to stimulate the system. Gymnastic apparatus, stretching, pulling and lifting machines often aggravate your condition. Starvation diets may merely weaken you more. Electrical and many other trumped-up treatments, muscle manipulation, baths, ordinary physical culture, forced deep breathing, mystics—all fail to get to the cause of your weaknesses and diseases. Nature only can help you. Nature is supreme in the regulation, restoration and revitalizing of the human body. But you must give Nature a chance—you must help her—and this you can do most certainly, most effectively through

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—Science of Health and Strength. It Will Do Wonders for You

Strongfortism isn't an experiment. There's no guesswork about it. It was through the methods I used in developing my own body until I won the world's record as the finest specimen of muscular development and championships in feats of great strength, in Europe and in the United States, that I constructed the science of STRONGFORTISM. It is through it that I reclaim wrecked and weak men, make them into new beings and give them a body and arms of which they can boast. I require you to use no apparatus. No drugs or medicines are prescribed. No inconvenient hours are required. Only a little of your time in the privacy of your own home is necessary to follow my easily understood instructions—and, oh man, how glad you'll be that you listened to me, once you start on my course. It means a new day for you, that's sure as you're alive.

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No man seeking to be healthy, vigorous and strong can afford to be without this book. I've packed the experience and research of a lifetime of physical and health building into my startlingly interesting book, "Life's Energy Through Strongfortism." It is priceless! In it are plain facts that will astonish you and help you out of your sorry plight. It will tell you frankly how you can make yourself over into a vigorous specimen of vital manhood with 100% pep, power and personality. It doesn't mince words. It will show you how to be true to the best that is within you—teach you how to be a real fellow. It is a man-builder—a success-maker and a life-saver. Just check the subjects on the free consultation coupon on which you want special confidential information. Send for your copy of this book right now—TODAY!

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Other Ailments.....

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Age..... Occupation.....

Street.....

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WHY earn \$15 or \$20 or \$30 a week, when in the same six days as an Electrical Expert, you can make \$70 to \$200 — and do it easier — not work half so hard. Why, then, remain in a small-pay, no-future job that offers no chance for big promotion — no chance for big income? Fit yourself for a real job. **Get into Electricity.** That's where the big money is being made, and always will be made.

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To learn Electricity my way you don't have to be a College man, or even a High School graduate. You can read. You can write. That's enough. With me, you get experience as you go along and make good money while learning. I'll show you how, — and I'll give you, without extra cost tools and apparatus to work with — 6 Big Outfits in all.

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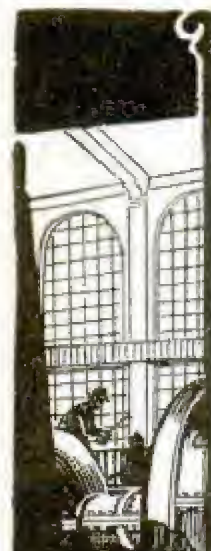
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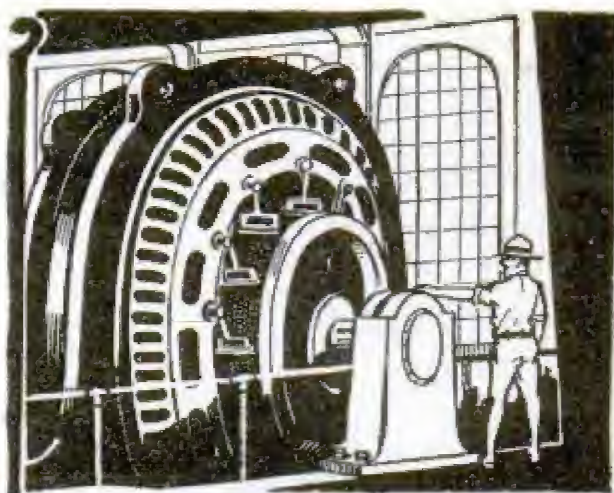
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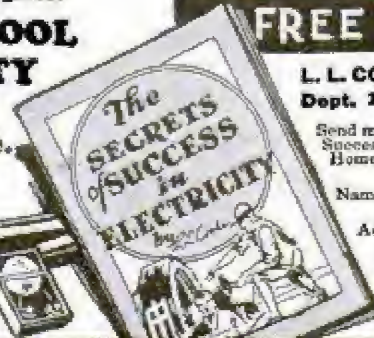
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TIME Counts in applying for patents. See pages 140 and 141. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

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TESTED Formulas. Catalog and actual samples free. Grinstead Company, Oswego, Kans.

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GUARANTEED Formulas and trade secrets. Big money making your own products. A. Hanlon, Stratford, Pa.

FORMULA. Expert supplies, up-to-date formulas. Lists free. Donahoe, 2621 Jackson, Wilmar, Calif.

MOST Sensational formula bargain ever offered. Latest, best sellers. List free. Specialty Mfg. Service, 801 So. Farragut, Bay City, Mich.

400% PROFIT. Two guaranteed formulas \$1.00. Metal polishing cloths, windshield cleaning cloths. Bussier Company, 193 Ruth, New Bedford, Mass.

3,000 FORMULAS \$1.00. 500, 50c. National Service, 2937 Marburg, Cincinnati, O.

MY Silver plating fluid, formula \$1.00. Reliable Products Distributors, 925 S. 22d, South Bend, Ind.

TABLECLOTH—Looks like linen, washes like oilcloth! Mystic polishing dross. Lac-Nu auto refinish. These tested formulas, \$1.00 each; samples free. Catalog. Grinstead Company, Oswego, Kans.

FREE Formula catalog, illustrated, agent-pitchmen-household and automobile specialties. Western Chemical, Salem, Oreg.

FORMULAS: Guaranteed, latest and reliable, catalog free. Golden West Specialty Labs., 5132 N. 17 St., Omaha, Nebr.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

ASSOCIATED Chemists, Indianapolis, Ind. Analysis and chemical consultation. Manufacturing ideas developed. Money-making formulas. Charges moderate. Write.

INDUSTRIAL Chemist furnishes formulas, plans, trade secrets. All lines. Work guaranteed. Lists free. J. F. Mazur, 941 20th, Lorain, Ohio.

GUARANTEED Formulas, best science can produce for making popular, biggest-selling specialties all lines. Don't buy formulas till you've received valuable eye-opening literature. Miller, Chemist, 706-F Jetton, Tampa, Fla.

15,000 FORMULAS in "Scientific American Encyclopedia of Formulas." Includes following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mucilages, bleaching, renovating, coloring metals, dyeing, glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, canning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Send no money. Just write a postal. When postman hands you book pay \$3.50 and postal charges. Popular Mechanics Press, Room 305, 200 E. Ontario St., Chicago, Ill.

SUCCEED With your own products. Make them yourself. Formulas, processes, trade secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

FORMULAS: Guaranteed, catalog free. Restovall Laboratories, 6720 Oconto, Ave., Chicago.

AGENTS WANTED

WANTED At once: More good men to introduce and retail Rawleigh's Good Health Products. Town and Country. Wonderful opportunity. Get into business with backing of largest manufacturer of its kind. Capital over 15 million dollars. Quick freight, express, parcels post service from 10 great factories and branches—one near you. Nothing new—no experimenting. No experience required. You simply follow the same old time-tested Rawleigh Methods which secure the most business everywhere and have given consumers best values and satisfaction for 40 years, 170 necessities frequently needed every home. Enormous demand. Annual sales now over 35 million products. Big free trial inducements. Quick easy sales. Repeat every 30-60 days. Enormous profits—\$200-\$400 month and more clear profits. Steady year around; no lay-off. No boss—you become sole owner and manager. Practically no capital required. We supply everything—stocks, outfit, sales and service methods. Big pay every day. Profits increase every month. "First come first served." For full particulars write W. T. Rawleigh Co., Dept. A-6PPM, Freeport, Ill.

\$241.10 CASH One day. That's what A. E. Martin made without experience just showing latest amazing auto light—38,000 candle power without glare. Fits any headlamp, easily installed. No dimming, no tilting. Makes astounding demonstration anywhere night or day. Distributors cleaning up to 250% profits. Sells on sight. Hamilton does \$2,000 first month. You bank \$127 weekly on only three sales a day. Exclusive territory open. Write today. Aerial Electric Co., 337 W. Ohio St., Chicago, Ill.

JUST Out—New patented apron. No strings or straps—\$20.00 a day every day; over 100% profit; commissions daily. Write for free outfit. Sta-Put Co., Dept. 206, St. Louis, Mo.

AGENTS—Make a dollar an hour. Sell new kind of sharpeners. Sharpens all knives and tools quickly. Demonstrating sample 10c. Premier Mfg. Co., Dept. 92, Detroit, Mich.

OVER 125 Reliable manufacturers need representatives in every locality in the United States. For complete list of firms and full particulars write Opportunity News, Dept. M, 750 No. Michigan, Chicago, Ill.

\$50 WEEKLY. Men wanted to demonstrate and take 10 orders daily direct from motorists. Amazing magnetic trouble light. Sticks anywhere! More orders, bigger pay. Write for demonstrator and particulars. Magno, Beacon Bldg., Dept. 166, Boston, Mass.

AGENTS: Free catalog 200 household specialties, toilet preparations, food products, portraits, frames, pillow tops, medallions, religious goods, pictures. Credit. James C. Bailey Co., Station C-6, Chicago.

AGENTS Make big money—selling new invention adjustable steel closet and pantry shelf 24 to 48 in. long. One minute to put up. Sell every home. Hardware, drygoods store. Send \$1.50 or 3 for \$4.00 postpaid. Exclusive territory given. Hall Mfg. Co., 715 E. 62nd St., Chicago.

VICTORY Tire Rim Tool. Changed tire 24 seconds. No experience necessary. Splendid opportunity for active men, select your territory today. Write immediately for information. Victory Tire Rim Tool Co., 1516 Pico Blvd., Santa Monica, Calif.

200% PROFIT. Amazing, new polishing cloth. Distributors wanted, appoint sub agents, and sell dealers. Sample free. P. M. Sterling, 1913 West Ninth St., Los Angeles, Calif.

LEATHER Compound, new. Fills holes in shoes, cracks, rubbers, wears like leather, waterproof. Agents repeat business. Sample can \$1.00. Henry Steffen, 620 Belmont, Chicago.

HEY-Y-Y! Tablecloth—Looks like Linen; washes like oilcloth. Make them yourself; formula, process, \$1.00. Sample free. Mystic Polishing Floss; formula \$1.00. Sample free. Lac-Nu Auto Refinish; formula, \$1.00. Formula catalog free. Grinstead Company, Oswego, Kans.

\$75-\$150 WEEKLY; Glo-Bac! Amazing new necessity for every car owner. Fleet owner, garage. \$2.00 saves \$75.00. Big profit. Marvel-Glo Company, Dept. B-3, Columbus, Ohio.

POLMET Polishing Cloth removes tarnish from metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retail \$25; sample free. Gale & Co., Inc., 15 Edinboro St., Boston, Mass.

32 SECONDS Complete tire change by Delmer, Ohio, with Morey Quick Action Rim Tool. Sold, singly, 49 three days cleared \$100. Anderson, Mont., sold 1,400 in 14 weeks. Get details for good territory. Harvest time now. M. Morey Rim Tool, Buffalo, N. Y.

REMNANT Store, Bethel, Ohio. Greatest Dry Goods Bargains on Earth. Agents and Dealers.

WHOOPEE Hats going over big. Everybody's wearing 'em. You can't afford to overlook this. Write immediately for particulars. (Sample postpaid \$1.25). J. P. Brown Company, 912 Trinity Avenue, New York.

\$10-\$25 DAILY Simply showing new Polly wrench. 10 wrenches in one. Guaranteed seller. Sample free. Gellman Mfg. Co., Dept. 6F, Rock Island, Ill.

AGENTS—Magic counter cards of Glit-sufes; pays agents \$29 day; our amazing plan guarantees sales. Write Glit Co., 25119 Chicago Ave., Chicago, Ill.

5,000 MEN Wanted to collect and refine used crank-case oil by great new discovery. No machinery—enormous profits, permanent business. Tested and approved by leading chemists. Send \$1 for complete money back guaranteed process. R. W. Barker, Chemist, 1796 S. Michigan, Chicago.

\$75 WEEKLY. Man or woman wanted with ambition and industry. To distribute Rawleigh's Household Products to steady users. Fine openings near you. We train and help you so you can make up to \$100 a week or more. No experience necessary. Pleasant, profitable, dignified work. Write today. W. T. Rawleigh Co. Dept. F-53 PPM, Freeport, Ill.

NO Dull times selling food! People must eat. Federal distributors make big money; \$3,000 yearly and up. No capital or experience needed; guaranteed sales; unsold goods may be returned. We furnish you with sample case, license and free samples for customers—sure repeat orders. Exclusive territory. Ask now! Federal Pure Food Co., A2307 Archer, Chicago.

MAKE \$500. Show Tablecloths. Save laundry bills. Women scramble for them. Free sample. Muhler, Box 453-CK, Chicago.

FASTEST \$1.00 Seller ever produced. Housewives buy on sight. Approved by Good Housekeeping. Patented Duplex Sifter sifts and re-sifts without removing flour. Saves time and labor. Magons sold 120 first 24 hours. Profit \$34.40. Protected territory. Sample sales outfit 60c stamps. Oneek, 4501 Lexington, Chicago.

MAKE \$20 To \$35 a day selling Imprint Book Matches, spare or full time. Big repeat business—no investment—every merchant a prospect. Write Imprint Book Match, Dept. A-11, 877 Meigs St., Rochester, N. Y.

MEN With cars to demonstrate and sell the best auto polish on the market. Big money. Write Vacco Chemical Co., 3342 N. Whipple, Chicago.

ARE You old at forty? See our advertisement on page 73 of this issue. The Electric Thermal Company, 2118 Morris Ave., Steubenville, Ohio.

FREE Sample—Hu-Pe-Da Washing Tablets. Carl-Abbott Company, Oswego, Kans.

SELL Goodyear raincoats; \$2.95 up. Goodyear Rainwear, 346 Sixth Ave., New York.

STOP! 400 Fast selling specialties from many parts of world. Write for free wholesale catalog. Importing Co., Lesneuf Center, Minn.

AGENTS; Big profits installing new German patent. Auto-Way-Indicator operated by button from wheel. Write for territory and free offer. Karl A. Nelse, Technical Dept., 123 W. Madison St., Chicago.

EXCELLENT Sales and business opportunities in new chemical specialties in Peoples Review, 2519 So. Crawford Ave., Chicago, Ill. Copy free.

MECHANICS Improved scale holders. Roman Arndt, Box 1401, Detroit, Mich.

AGENTS \$60 Week—Sell finest line guaranteed hosiery. All new styles and big sellers. Big commission. Earn silk hose for your own use. Write quick for sample outfit. Silknet Hosiery Co., Dept. 431, Dayton, Ohio.

AGENTS. Send for free sample. "Fretnot" washes clothes snow white without rubbing. \$5.00 daily and more easily made. Credit given. Empire, 2046 Lincoln Ave., Dept. 101, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

GENUINE Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

\$2.95 AUTOSEAT Covers—Cash daily—Amazing all America-Postcard brings Leatherette Sales Outfit. "Quality." J513 So. Dearborn, Chicago.

\$350.00 MONTHLY Selling newest, longest wearing Evergreen Tablecloths. Beautifully embroidered. Looks like linen. No laundering necessary. Get sample. Linnette Mfg. 361 W. Ontario, Chicago.

GENERAL Agents. Sell well known Cedar crystals—kills moths, disinfects. Retail \$3c, also 25c paddle that hangs on hook. Women buy one to six. Free particulars. Geo-Dar, 1177 W. Washington, Chicago.

\$2.95 GENUINE Trench Coats all colors. Also full line raincoats, DuPont launderless Fabricoid tablecloths, dresses, rubber aprons, famous protecto bag, etc. 100 lire sellers. Free outfit. American C726, Roosevelt, Chicago.

AGENTS—That something new and different you have been looking for. Just out. No competition. A quality product that makes steady sales and repeats certain. 100% profit to you. \$10.00 to \$20.00 daily. Seeing is believing. Send \$1.00 for sample and information. J. R. Council, Sales Manager, Box 372, Hollywood, Calif.

DUST REMOVERS. Saves nine tenths of car washing. Sample sent dealers on application. Dust Remover Co., Fayette, Ohio.

SELL Patented Nitralgram Automobile Crests with interchangeable initials and fraternal emblems. Every car owner a prospect. Sells for \$1.50 a set. Costs you 75c. Send for literature and sales proposition. Morton Jewelry Co., 74 West 46th St., New York City.

SELL Tiles—Make big profits. Get big sample selling outfit absolutely free. Wonderful patterns. Splendid value. Liberal commissions. Write today to Public Mills, 4933-CP Hudson Boulevard, North Bergen, N. J.

EXCLUSIVE Condolence card. The Orphans Mothers Day. Hand painted onyx stock. Sample 12c. Big 25c seller. James Chambers, Bessemer, Ala.

SELL By mail! Books, novelties, bargains! Domestic and imported, large profits. Particulars free. Institute, Desk 14, GPO Box 223, New York.

12,000,000 SOLD Annually. "The World's keenest business." Sell razor blades, all makes under your own name, retail, wholesale, through agents and by mail. 40 page book 10c, or free particulars. H. Bruns & Sons, 2501P, Sherman Avenue, Madison, Wis.

\$50.00—\$75.00 WEEKLY. Newest window letters out. Easiest to put on. No experience needed. Free samples. "Ralco," 1045 Washington, Boston, Mass.

WANTED. Agents to sell our wonderful invention \$20.00 per day easy made. C. A. Myers Company, 6324 Woodlawn Ave., Chicago, Ill.

NOVELTIES; 165 Designs. 10c. Black Studio, 1249 S. Grand, Los Angeles.

"KLEVER KLAU". The wonder tool of a thousand uses. Greatest demonstrator. Free sample. Full particulars. Kyser Bros., Lowell, Mich.

HOSIERY Agents: New manufacturing process enables us to offer our famous pure silk hosiery at lowest prices ever known! Agents making \$5-\$15 daily! Big outfit free! Write, Racine Feet Knitting Co., Dept. 10, Beloit, Wis.

DISTRICT Managers! Crew managers! General agents! Wanted: Men and women to appoint saleswomen to sell "New Idea" imported sanitary necessity. New feature never before used. Every woman buys and repeats. New sales plan nets you big profit on sub-agents. Exclusive territory to producers. Write quick, Box J-708, Meriden, Conn.

\$15 DAILY Selling custom quality shirts and ties. Largest cash commissions, extra bonuses. Outfit free. District managers wanted. Parmode, 21 Lesser Bldg., St. Louis.

AGENTS—Make money and friends selling Old-Gold Quality Toilet Goods. Write Old-Gold Chemical Co., 49-51 South Third Street, Memphis, Tenn.

MIRRORS Resilvered at home. Costs near 5 cents per square foot; you charge 75 cents. Immense profits plating autoproducts, reflectors, tableware, stoves, refinishing metalware, etc. Outfits furnished. Details Free. Write Sprinkle, Plater, 128, Marion, Ind.

GREATEST Soap discovery of the age! Made from South Sea Island plants. Produces 2 and 3 times more lather. Sensational seller. \$1.25 an hour easy. Write for samples. Albert Mills, 3775 Monmouth, Cincinnati, O.

SELL "Prevents Ruin." Guaranteed to prevent ruin in silk hosiery. Large profits. Particulars. Specialty Mfg. 307 West First, Los Angeles, Calif.

VACATION Money! Sell attractive greeting cards, gifts. Hurry! Arthur Studios, 363 Montague, Montclair, New Jersey.

AGENTS. Lustre-Bac, new auto refinishing restores color lustre instantly. Donahoe, 2621 Jackson, Wilmar, Calif.

SELL Supreme No-Cement tire and tube patches. 300% profit. Particulars. Supreme 135 Winder, Detroit, Mich.

CARTER Wig-l-w washer. No investment. Big profits. Exclusive distributors. Cleans, dries, polishes. Carter Products, 956 Front Cleveland, Ohio.

EASIEST Thing ever sold. Rubber nozzle washer won't scratch car. Retail, \$2.00. Sponge Nozzle Co., 3780 Clairmont Ave., Detroit, Mich.

AMAZING Invention, combs and waves hair. Sells every woman, pocket carries dozens. Rex Sales, 1235 Lexington Ave., New York City.

AGENTS Become a regular established McConnon dealer! Buy on credit; sell for cash or credit. 228 absolute household necessities; all repeaters. Enjoy a sure income 52 weeks per year, year after year. City or country trade. Capital, experience unnecessary. McConnon & Co., Dept. M900, Winona, Minn.

ZIPLITERS—Gaslighter samples 25c. Cigarlighters 50c. Enormous profits. Ziplite Mfrs. 3216 Kossuth Ave., Bronx, New York.

FREE Booklet describes 67 plans for making \$20—\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., N. Y.

ENERGETIC Men earn \$40 weekly installing dust shields; women dislike cleaning corners. Write: Ideal Stairway Equipment Co., Dept. PM, Canton, Ohio.

\$15 A Day sure. Guaranteed solid leather shoes. Unequaled low prices. 85 styles: men's, women's, children's. Free outfit offers complete line shoes, raincoats, leather coats, puttees. Consolidated Shoe System, Dept. 615, Eau Claire, Wis.

MANUFACTURE Auto Specialties: Radiator Seal, Hand Soap, Puncture Plugger, Silk Life, Glass Cleaner. Get my free list. John Mickman, Chemist, St. Paul, Minn.

AGENTS Wanted—On a fast selling 25c item for the kitchen, costs you 8½c. Sample sent parcel post prepaid for 10 cents. P. Seed Filter Mfg. Co., Inc., 353 Broadway, New York.

BIG Money manufacturing vaphila flavor in your own home. Sell to housewives, stores, bakeries, hotels. Guaranteed formula. Instruction \$5.00. Stark, 1216E College, Bowling Green, Ky.

SELL Cigar Lighter like fountain pen. 50c. Stevenson, 162 Champlain, Rochester, N. Y.

AGENTS—\$75.00 Weekly! "Dependa" garage door holders—something new. Sells on sight. Garage owners and builders live prospects. Melbye, 3204 N. Oakley, Chicago.

AGENTS, \$15 Daily made easily with Mistle Ice Blankets; costs 40c, sells for \$1. Selling outfit free. United Laboratory, Dept. 21, Batavia, Ill.

IT Rings the bell for salesmen who must have big money. Krystal Kleen actually sells 100% on calls. Its demonstration is irresistible. Its field is three-fold. Fifty-fifty deal. Write today. Penton Chemical Company, Jackson Heights, New York.

WE Offer the selling agency for the world's largest, most complete direct to wearer men's wear line; consists of 135 large cloth samples, shirts, neckties, underwear, pajamas, waterproof trench coats and lumberjacks; spare or full time; experience unnecessary; outfit free. Howard, 1213 Van Buren, Factory 242, Chicago.

WONDERLITE Mfg. Co. Wants men to sell new Magnetic Trouble Light—most useful automobile accessory—sells at sight—commissions, special bonuses—big money getter. Send for demonstrator and particulars. Dept. P, 1201 Industrial Trust Bldg., Providence, R. I.

A GOLD MINE—New liquid discovery mends fabrics—hosiery. Stops runs. 400% profit! Every woman buys. 100 other fast sellers. Johnson Co., Dept. 478, 6129 Wentworth, Chicago.

BECOME Your home town leading business man. Sell full line of groceries, motor oils, paints. Everybody a customer. No capital or experience necessary. Selling outfit free. Write Loverin & Brown, 1602F, So. State, Chicago.

INSTANT Weld welds rubber instantly. Stock's profit one day \$72.25. Enormous demand. Exclusive territory. Free sample. Tourists Pride Mfg. Co., Desk E, Minneapolis, Minn.

WELLS Cleared \$620.00 in one month with amazing book "Business Guide" and free legal service. Outfit free! Prof. Nichols, Dept. 117, Naperville, Ill.

STRANGE New electric iron cord! Prevents scorching. Saves electricity. Cannot kink or snarl. Used on telephones also. \$25 daily. Samples free. Neverknot, Dept. 6-A, 4503 Ravenswood, Chicago.

SELL Men's neckwear—wonderful proposition. Astor-M, 39 East 23th, New York.

\$5 SALE—\$5 Commission. New combination life-accident policy. Write immediately. United Underwriters, PM-3, Willow Hill, Ill.

AGENTS—\$250 Month. Raincoats. All colors. Your choice \$2.65. Part time \$2 hour. Complete line 60 patterns. silks, suedes, tweeds, Leather-Lyke, Outfit sent free, postage prepaid. Write Comer Mfg. Co., Dept. W-5143, Dayton, Ohio.

AGENTS—Absolutely new! Our hand-colored popular-priced Photo Statuettes going big! Everyone wants them! Agents making \$10-\$25 daily! Samples furnished! Craver Mfg. Co., L2456, Jackson, Chicago.

WHERE To buy 500,000 articles at lowest wholesale prices. 1929 directory. Distributors wanted. Pruitt System, Brookfield, Ill.

MAKE \$20 Daily selling merchant's Changeable Letter Show Window Signs. Experience unnecessary. Send for free sample offer. Maze Company, 542 W. Washington, Chicago.

\$15 DAILY Selling custom quality shirts and ties. Largest cash commissions, extra bonuses. Outfits free. District managers wanted. Parmade, 21 Lesser Bldg., St. Louis.

AGENTS—No selling—Place Mystery Ploss in stores. Easy winner. Counter Display. Mohler, Box 453-CU, Chicago.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

WE Have the finest needle case, self threading needles, needle threaders. \$50.00 to \$200.00 weekly. Samples 25c; particulars free. Empire, 2646 Lincoln Ave., Dept. 201, Chicago.

AGENTS \$300 Month. Bonus besides. Sell guaranteed silk hosiery. Must wear 7 months or replaced. Producers earn auto. Write for samples. Free silk hosiery for your own use. Betterknit Hosiery Co., Silk, 4431, Greenfield, Ohio.

AGENTS "Strike a gold mine" when selling Nulustrs Cloths at 25c; cleans, polishes all metals; the duller the metal, brighter it shines. Everybody delighted. Agents sell 102 boxes out of 116 calls. Write for free samples and proof. Shet Mfg. Co., 1 Shet Bldg., Weehawken, N. J.

BIG Pay every day taking orders for Dress Shirts, Work Shirts, Pants, Overalls, Sweaters, Underwear, Hosiery, Pajamas, Playsuits! Experience unnecessary. Outfit free! Nimrod Co., Dept. S, 4922-28 Lincoln Ave., Chicago.

AGENTS. Our cigar lighters, musical novelties and salesboards sell quick. Large wholesale catalog free. Joseph Sales Company, 223 Madison St., Chicago.

EARN From 2-4 dollars an hour in your spare time taking orders for (Superior Home-made Rugs). Inquire, W. A. Baum, Marlita, Pa.

IT'S New—It's great. Sells everywhere. Metal polish in tubes. A real money maker. Trial tube free. P. M. Reid Manufacturing Co., 1619 Clark, St. Louis, Mo.

100% PROFIT. Amazing Paste quickly removes rain spots, polishes nickel on automobiles, etc. Complete line home necessities. Williams Corp., 305 Williams Bldg., Montclair, N. J.

FREE Shirts, Hosiery, Underwear and \$35. Weekly for spare time—\$90 Full time. Sure Sales Plans Guarantee Success. Selling outfit free. Write today. Shaughnessy Knitting Co., 784-C, Shaughnessy St., Watertown, N. Y.

BIG Cash commissions daily taking orders for new patented mothproof clothes hanger. Eliminates bags, chests, sprays. Every housewife buys 6. Big season now. Sample free. Austin Accessories, F-2630 Shields, Chicago.

SELLING Like blazes! Beautiful toilet goods assortment at \$1.50 with 24 inch Pearl Necklace free to your customers. 100% profit. E. M. Davis, 234 W. North Ave., Dept. 530, Chicago.

\$25 DAILY. Raincoats, all colors, \$2.45. Trenchcoats, alligators, leatherettes. Free coat and outfit. Bradley, Dept. AB-6, 230 So. Wells, Chicago.

AGENTS \$240 Month. Dri-Kleanit removes dirt, grease, tar, all one operation. Cleans car for 10c. No soap or water used. Car looks like new. Wonderful seller. Free sample. American Accessories Co., Desk 4831, Cincinnati, Ohio.

AGENTS Buy direct, hosiery, lingerie at lowest mill prices. Unusual opportunity. Act quick. Superior Knitting Company, Dept. 17, New Haven, Conn.

MAKE \$15.00 Daily! Simply show Rhinestone Initial Buckles, Fountain Pens, etc. We deliver. No competition. No investment. Write quick for special free sample outfit. Chaton Novelty Co., Dept. C, 606 Blue Island Ave., Chicago.

SELL Ceiling fly swatters, sample 30 cts. Ceiling Swatter Co., Glenolden, Pa.

AGENTS, \$15 Daily in advance selling the only guaranteed electric waffle iron at \$2.50. Everybody buys. Sample furnished. Supreme Products, D8 So. Dearborn, Chicago.

BURG-LA-PROOF! Men and women to sell our automatic window lock. Allows windows to be opened for ventilation, yet locked in any position for protection. Instantly demonstrated without tools. Sell at least six to each home. 100% profit. B-L-P Window Catch Company, Box 57, Everett, Mass.

\$75.00 WEEKLY Demonstrating and distributing Rich's Soft Drink Powders to homes, stores, stands. Powell sells 30,000 monthly. Start with or without capital. Sol P. Rich Co., 622 So. Sangamon, Chicago.

NEW Summer line ready sweaters, hosiery, shirts, underwear, silk lingerie, raincoats. Undersell stores—make \$110 weekly. Outfit free. May Co., 193 So. Wells, Chicago.

MAIL Order information—an unusual money making proposition; particulars free. Flenco, Box 5, Station F., N. Y.

AGENTS Coin money showing our line Sturgis Novelty Shop, Sturgis, Mich.

AGENTS. Look! Men's imperfect fancy hosiery \$14.00 gross pairs, rayon imperfect neckwear, \$6.00 gross. Send today \$10.00 for one gross assorted. Lewis Hosiery, 12 N. 3rd, Philadelphia, Pa.

\$61.50 WEEKLY Introducing and selling a new gas light burner for kerosene lamps. No chimney. No mantle. Samples free. Luther Mfg. Co., Dept. 650, Cincinnati, O.

SHARPENER For scissors and knives. Has flat, movable, re-versible, and re-newable sharpening surface. Live seller at 300% profit. Sample 25c. Lake Mfg. Co., Clarendon, Va.

TREMENDOUS Weekly earnings. Sell greatest labor-saving device ever invented. Patented article sells on one-minute demonstration every home, factory, store, office. Write today. Dept. PM6, Wonder Window Washer, 31 East 10th St., New York.

\$150—\$200 WEEKLY. Amazing new invention brings new riding comfort to coach owners! Grab this quick. Over 16 million prospects. Go-Itte, Flint, Mich.

EVERY Gillette user wants a Jones Strop-Per. A gold mine for workers. Sample \$1.00, refunded with first dozen order. Jones-Rutherford Co., 3656 Bryant St., Denver, Colo.

LACEY'S Patent Sense. Valuable book free. See ad page 145.

FREE Booklet describes 67 plans for making \$20—\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., N. Y.

SELL Hanslick, powdered soap. On market 8 years. Easy seller, everybody customer. Fine repeater. Big profits. Sample free. Solar Products, J2144 S. Troy, Chicago.

AGENTS. Our gold-eyed needle cases are wonderful sellers; immense profits: \$50 to \$300 weekly; proof free; sample outfits 10c; factory prices. Paty Needle Co., West Somerville, Mass.

SPLENDID Income for crew managers. Extra heavy demand in spring and summer for Duo Wonder Cleanser, Gloss Oil, other specialties. Large all-year line household necessities. Prices right. Big discounts on large orders. Beautiful premiums for customers. A-1 service. Write today. Duoform Co., M-1, Attica, N. Y.

HINGE Clevis every farmer must have. Sells on sight. Send 50c for sample and proposition. Hinge Clevis Co., Canistota, S. Dak.

MONOGRAM Automobiles. \$1.35 Profit ten minutes' work; every owner wants them; millions without; particulars free. Motorists Accessories Co., Mansfield, Ohio.

PORTRAIT Men: Why not Pasco portraits? We refund your money for all you cannot deliver. Frame catalog free. Portrait Agent's Supply Co., Dept. F, LaPorte, Ind.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-T West Van Buren, Chicago.

"MAGNAKLOTH" Taking people by storm, one rub, absorbs dust from car or furniture, quick sales, big profits. National Service Co., B. Pierre, S. Dak.

ARVEO Polishing Cloths offer big profits to salesmen. Sample and particulars free. Arveo Industries, Box F 147, Gross Ile, Mich.

AGENTS For "aladdin" polishing cloths; big demand wherever shown, 200 per cent profit; sample free. L. Dougherty, 518 West 39th St., New York.

\$60-\$200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark Chicago.

GET Our free sample case—Toilet articles, flavorings and specialties. Wonderfully profitable. LaDerma Co., Dept. A, St. Louis, Mo.

MAGIC Polishing cloth. Great seller. Big profit. Try this cloth. It's a money maker. Samples free. Get this proposition. Newton Co., 25 Main St., Newark, N. Y.

START A business of your own selling fifty different kinds of household brushes. Send for catalog and free sample case offer. National Brushes, St. Louis, Mo.

WRITE Atlas Sign Works for free working equipment. Beautiful gold window sign letters. Penny each! Any size. Wonderful offer to general agents. K1032 E. 55th St., Chicago, Ill.

START The new year right! Manufacturing these popular specialties yourself. Have salesmen everywhere. Investment small. Profits great! Get my eye-opening literature explaining all. Mystery Polishing Floss, Loidax, guaranteed automobile refinishing; Thermox Eveready Anti-Freeze; twenty-six new unusual carded specialties, many other wonderful necessities. Here's an exceptional opportunity. Miller, Chemist, 706-B Chemical Building, Tampa, Fla.

ENGRAVED Nameplates, signs, numbers, initial, desk, city nameplates. Big profits. Hilton Specialty, 90 Stewart, Providence, R. I.

AGENTS—Fastest selling household necessities for men and women. Big profit. Ideal Utensil Company, Otis Bldg., Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfits. Emblem checks, check-tobs, name plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS—\$50 Weekly selling shirts. No capital or experience needed. Commissions in advance. Samples free. Madison Company, 506 Broadway, New York.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

PHOTO Medallion Men and Women, the largest line of Photo Novelties in the world. Lowest prices, quickest service. Send for catalogue showing over 200 money makers. Photo medallions, photo medallion clocks, photo mirrors, photo fountain pens, photo powder compacts, photo jewelry and photo buttons. Gibson Photo Jewelry Co., 608-614 Gravesend Ave., Brooklyn, N. Y.

THE Christensen Mop Wringer. It rubs the mop and scrubs it clean. H. K. Christensen, Fort Atkinson, Wis.

AGENTS—Moss Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 429 Searle Bldg., Rochester, N. Y.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H. Decatur, Ill.

FLAVORING Extracts—Bottle yourself! Concentrated, add water. Free labels. 500% profit! Whirlwind moneymaking opportunity! Hurry! Thomas Manufacturing Company, Indianapolis, Ind.

OUR Luminous Crucifix Shines in the Dark. Every one amazed at the wonderful effect. Easily demonstrated—easily sold. W. G. Hannan Co., 2543 So. State St., Chicago.

40 CENTS Profit on every \$1.00 sale. Our article is a repeater. Excello Sales Co., Shreveport, La.

ELECTRIC Cigar Lighters. Make \$100 week. Brilliant flashing advertisements. Three beautiful models. Used by dealers everywhere. Write Drake Mfg. Company, Dept. M, Milwaukee, Wis.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

TWO Money makers for agents. "Francia" Pocket Adding Machine retails \$4.85. To you \$1.00. "Excelligraph" Rotary Stencil Duplicator \$37.50 retail. Write Type-writer Supply, 102 Hersch Bldg., Pittsburgh, Pa.

SUCCEED With your own products. Make them yourself. Formulas, processes, trade-secrets. All lines. Catalog, circulars free. B. Thaxly Co., Washington, D. C.

\$50.00 WEEKLY Easy, applying gold initials on automobiles. No experience needed. \$1.45 profit every \$1.50 job. Free samples. "Ralco Monograms," X1043 Washington, Boston, Mass.

REPLATE Brass worn-off automobile parts, reflectors, bath room fixtures, worn spoons, forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. \$1.00 half pints. Post paid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

MAKE Big money. Be the sign man in your town. New process. Beats them all. Particulars free. Swanson's, Inc., Mankato, Minn.

WE Start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 641, St. Louis, Mo.

BIG Profit! Fast sales! \$9.75 automatic washing machine. Guaranteed. Write Storm Royalty Co., 3801 Enright, St. Louis, Mo.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

AGENTS \$240 Month. Bonus besides. Producers earn auto. Introduce new guaranteed hosiery. 126 styles, colors. Finest silks. Credit given. Silk Hose for your own use. Samples furnished. Wilkint Hosiery Co., Dept. 7031, Greenfield, Ohio.

A BUSINESS of your own—Mixing sparkling glass name and number plates, check-boards signs. Big book and sample free. E. Palmer, 512, Wooster, Ohio.

AGENTS—Engraved name plates, signs, numbers, etc., easily sold, profits large. Brett Bros., Roxbury Crossing, Boston, Mass.

CALIFORNIA Perfumed beads selling like hot cakes. Agents coinng money. Big profits. Catalog free. Mission Factory P, 2328 W. Pico, Los Angeles, Calif.

"HOW to Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

\$12.00 DAILY Showing new table cloth. Looks like linen. Wash like oilcloth. No laundering. You just take orders. We deliver. Pay daily. Sample free. Bestever, 152 Irving Park Station, Chicago.

PORTRAIT Agents make more money than any other class of agents. Write for our new catalog—Portrait enlargements, medallions, etc. Adam J. Kroll & Co., 2543 South State St., Chicago, Ill.

FROM The Argentine. Imported from Buenos Aires, latest novelty, never before on American market, tremendous possibilities. Write: don Francis X. Cassera, Dept. PM, 23 Washington St., New York.

SELL Stores carded 5c Breathlets. Cost you 1c per package, 150% profit. S. H. Carroll Co., Albany, N. Y.

TIME Counts in applying for patents. See pages 140 and 141. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

\$50,000 PICTURE Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book "Profits in Portraits" explains. Sample free. Picture Man Friedman, Dept. 8, 109 West Austin, Chicago.

GOLD-LEAF Sign letters; copyrighted manufacturing instructions; profits 1,000%. Johnston Co., Quincy, Ill.

HIGH-GRADE SALESMEN WANTED

FEW \$1,000 Monthly earnings ads are truthful. Our men actually earn \$300 to \$500 regularly selling our lines. Adelite, the newweomer in electric window salesmen, is making a big hit. More for the money than anybody gives. Business posters for every line. Changeable letter system too. Permanent business for you working with us. Territory protected and repeats credited. Fat commissions. Full details will prove very interesting. Display Products, Ltd., 409-A East 31st St., Kansas City, Mo.

TO Market 3A garage door holders, simple automatic action, quickly installed, instantly attracts garage owners, builders, dealers. Write for exclusive territory proposition. Knowlton-Stevenson Co., 1118 Packard, Ann Arbor, Mich.

SALESMEN—Earn \$100 weekly taking orders for Dazzler and Rainbow glow electric signs. Big commission. Exclusive territory. High grade proposition. Write Chicago Sign Sales Co., Dept. 77, Charlotte, N. C.

STATE Manager wanted—Eastern manufacturer of marvelous auto safety signal, wishes to correspond with man or firm financially responsible to develop your state. Worth \$7,500 per year and up. Write Safety Sales Co., Distributors, 501 Colorado Bldg., Denver, Colo.

AGENTS, Salesmen, amazing \$-getter good for \$75-\$100 weekly; an everyday necessity in big demand at drug, department, novelty, cigar and general stores; sells 365 days of the year; cash sales; repeat orders come fast; lifetime opportunity for energetic men; get free folder, tells how. President, Tyrrell Products, 455A First, Martins Ferry, Ohio.

SALESMEN—Sell Suredge, the proven money maker. Only guaranteed low priced razor blade sharpener, honing and stropping all blades in ten seconds. 100% profit. Suredge, 15 E. 40th, Dept. E-1, New York.

BIG Pay every day taking orders for Dress Shirts, Work Shirts, Pants, Overalls, Sweaters, Underwear, Hosiery, Pajamas, Playsuits! Experience unnecessary. Outfit free! Nimrod Co., Dept. 65, 4922-28 Lincoln Ave., Chicago.

COVERALL Salesmen—Make \$20 daily selling new \$3.50 improved Coveralls, also service coats with customers name embroidered on back. Unusual construction. Commission 75%! Wonderful advertising value. Lowest priced; highest commission. Free outfit. Am. B. Co., P-329 W. Monroe, Chicago.

SALESMEN—Don't look further. Here is what you want for 1929. Best staple necessity to sell garages, oil stations, accessory stores. Always in demand. Liberal commission. Best co-operation. Our proposition will surprise you. Write today for particulars to Box 197, Spencer, Iowa.

BUSINESS Stationery—largest line—highest quality—quickest delivery—biggest commissions—liberal bonuses—free copyrighted cuts every business. Experience unnecessary. Instructions and outfit free. David Lionel Press, 312 S. Hamilton, Dept. 54, Chicago.

SALESMEN—\$1 In your pocket every half hour. Write orders for Hollywood Picture News. New idea advertising service for store windows. No competition; every store prospect. Permanent repeat business. Free sales outfit. Retail Stores Service Corp., 1105 Broadway, Dept. J4, New York.

AGENTS—I want a good, honest man or woman, all or part time, to look after my established business in your locality; take a few orders; distribute teas, coffees, extracts, spices, things people eat and use every day. I furnish everything, make you my partner; you keep half of what we take in; pay starts as soon as case arrives. Get my amazing offer. Curtis W. Van De Mark, 103-F Health-O Bldg., Cincinnati, Ohio.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 24.

BIG Money selling new preparation that will prevent runs in silk hose. Agents everywhere report tremendous sales. Every woman a prospect. We furnish amazing new sales guide and charts. Don't delay, write today. Save-O-Silk Laboratories, Box M, 262 Troy, Ohio.

AMAZING Screw-holding screwdriver! New patented invention! Removes, inserts screws instantly inaccessible places. Sells \$1.50, 100% profit. Factories, mechanics, garages, electricians, radio, buy on sight! Exclusive territory. Jiffy, 1968 Winthrop Bldg., Boston.

\$18 TO \$25 Daily! Biggest selling line of 2-piece suits, \$9.95 and \$12.50; 3-piece wool suit, \$17.95 (regular \$28.00 value). All-wool overcoats \$18.50. Splendid rain-coats, slickers and boys' suits. Biggest commission. Free outfits. "Jim" Foster, Inc., Dept. 26, 2250 S. Spaulding Ave., Chicago, Ill.

ADVERTISING Specialty men traveling in specified territory are earning from \$75.00 to \$200.00 per week selling our line of original and patented advertising novelties. Commissions paid same day order is received. No one but experienced men will be considered. Write today fully and frankly. Spotswood Specialty Co., Lexington, Ky.

ARE You old at forty? See our advertisement on page 73 of this issue. The Electro Thermal Company, 2113 Morris Ave., Steubenville, Ohio.

SALESMEN! New imported, popular price tickets. Merchants instant buyers. Every store needs them. Full (part time). Big proposition. Tiara, 160 Fifth Ave., New York.

SELL Printing! experience unnecessary; main or sideline. 40% commission advanced; copyright cuts and elaborate outfit free; beats all competition. Meyerson, 11132 So. Marine, Chicago.

EARN \$20 A day. Establish income for life selling for \$1 a year, \$1,500 accident policy. Write W. C. Stone, 11 So. La Salle, Chicago.

POOL Shooter. New fascinating vending machine. Merchants everywhere buy! Sideline men make \$200 weekly! Free pocket outfit! Specialty Mfg. Co., Dept. 1, 617 W. Division, Chicago.

HURRY! A sensational new vending machine just out! Can be used everywhere. Merchants waiting. \$200.00 weekly easy. Experience unnecessary. Chicago Mind, 4344 Ravenswood, Chicago.

ELECTRICAL Appliances and fixtures. needed every home, sell direct or to trade. Liberal commission. Kapneck, 1438 Columbia Road, Washington, D. C.

SALESMEN. Wonderful sideline. 40% commission paid daily. Sells all merchants. Pocket outfit free. Willens Co., Dept. 221, 2130 Gladys Ave., Chicago.

SELL "Union Label" business stationery. Lowest prices. Prompt delivery. Big commissions advanced. Amazing bonus. Outfitted, every business. Experience unnecessary. Outfit free. Northwestern, 2092 Division, Chicago.

NEW Invention—Sells every business. Used by Bell Telephone, Armour, etc. Four \$15 sales daily pay \$268 weekly. Write quick for exclusive territory. Adjustment Service, Dept. PM, Mobile, Ala.

SELL Printing. Commission in advance with or without deposit; 48-hour service. Write for outfit. E. Willis Printing Co., 5939 Wentworth, Chicago.

37% COMMISSION. Liberal repeats. New sales producing service increases business 20% to 50%. Every retailer live prospect. Sales Builders, 507 W. Madison, Chicago.

A PAYING Position open to representative of character. Take orders shoes-hosiery direct to wearer. Good income. Permanent. Write now for free book "Getting Ahead." Tanners Shoe Mfg. Co., 2096 C St., Boston, Mass.

EVERY Home a prospect. Make big money. Take orders free, shrubbery. Experience unnecessary. No dull season. Commissions paid weekly. We deliver, collect. Write Perry Nurseries, Dept. R-6, Rochester, N. Y.

WONDERFUL Invention. Sells fifty envelopes minute. Sells on sight at \$3.50. Attractive proposition. Square deal. Bank references. Kendall Sealer Co., C-12 East Jaffrey, N. H.

NEWEST, Finest and most complete line of novelties and pencils for 1929. State experience. Advertising Novelty Company, Newton, Iowa.

SALESMEN—Become Independent. Own your business; experience unnecessary. Selling our \$10,000 Accidental Death; \$50 Accident; \$15 Sick Weekly Benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department. Universal Policy, Dept. A, 19 Clinton St., Newark, N. J.

ALL Year round profitable business. Earn extra money spare time selling wonderful new water softener and cleanser. Cleans like magic, grease, ink and dirt from everything. Every home and business place a live prospect. 100% profit. Big repeat orders. Agents protected. Trial case \$4.00 delivered U. S. A. Seacoast Laboratories, Inc., Sea Bright, N. J.

\$78.00 MADE By Iowa salesman first day selling new hot dog machine at \$18.50, commission \$8.50; direct factory connections. Leonard E. Dickerson, Dept. E-13, Springfield, Mo.

BIG Opportunity sell vending machines. Resort towns. \$12.50 on \$32.50 sale. Pay daily. Postal Confection Co., (Manufacturers), 2033 Charleston, Chicago.

SELL Printing—40% commission daily; lowest prices; with or without deposit. Copyright cuts free. Inquiry brings pocket outfit. Merchants Assn., Insurance Center Bldg., Chicago.

CANVASERS: Stop! Look! Listen! Mexican curios, den fixtures, Indian rugs, feather work. Fastest selling goods. Full particulars, samples fifty cents. G. Medina, 78-P LaRosa St., Mexico City, Mexico. Highest references.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1984W Broad, Richmond, Va.

ADVERTISING Pencils. Quick-action sideline money-maker. Free samples for real salesmen. Northern Pencil Works, 126 So. Clinton, Chicago.

PRINTING Salesman wanted; salesbooks, manifold printing, stationery, restaurant checks, register printing fanfold, tags; full or part time; splendid opportunity. Shelby Salesbook Co., Shelby, Ohio.

JUST Out! Amazing new vending machine! Pays merchant 1,600% profit! Sensation wherever introduced. \$50.00 daily! Dept. 2, Acme, 4554 Broadway, Chicago.

GOLD-LEAF Window letters and script signs; no experience; 500% profit; samples free. Consolidated, 69-Y West Van Buren, Chicago.

STATE Mgr. Marvelous invention seals 3,000 envelopes hourly! Sells \$4.50 only; equals work expensive electric machines. Offices buy 1-100. Exclusive territory. Opportunity earn \$7,000 yearly. Free trial offer. Write quick! Rede, 32 Winthrop Bldg., Boston.

SALESMAN: Sparkling chipped glass, name plates, house numbers, signs. Request particulars. Roscoe Lynch, Bausman, Penna.

REPRESENT Auto seat cover manufacturer. Direct to automobile owners. High quality, low prices. Make \$125 weekly. Elaborate samples free. Marcelo, 2302 Wabasha, Chicago.

PUNCHBOARD Men! Sideline salesman! Sensational merchandise catalog just added to famous "Lincoln Line"! No more closed territory! \$200 weekly. Easy repeat commissions paid daily. Smashing color catalog free. Samples unnecessary. Best season now. Get busy! Lincoln Sales, 116 So. Wells, Chicago, Dept. D.

SUCCESS is no accident! You will fully understand this slogan when you examine our automatic credit and collection plan. Copyrighted, brand new, unusual. You make 250% on original sale. Half cash on repeats without call-backs. Commonwealth J. Publishing Company, 505 So. Dearborn St., Chicago, Ill.

SALESMEN—Four \$15.00 sales to merchants net you \$40.00 daily. Sayers Systems, 2812 Sheffield, Chicago, Ill.

SALESMEN: Manufacturer and distributor one of country's leading lines automotive shop equipment and hand tools offers exclusive territory. Proposition assures good income; advance against commission basis. Applicants must be financially responsible, have some knowledge of tools and must own car. Write for proposition to Mr. Merrill, Woods Organization, Inc., 37 W. 20th St., New York, N. Y.

SIDELINE—New! Quick seller to merchants, banks, manufacturers. Full commissions daily. Pocket sample free. Carroll Co., 319 N. Albany, Dept. 346, Chicago.

PUNCHBOARD Salesmen. \$10,000 yearly. New line. All fast sellers. Lowest prices. Full commission on repeat business. Catalog free. Hurry! Puritan Novelty Co., 1409 Jackson, Chicago.

\$100-\$200 A WEEK. Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-A North Clark, Chicago.

HELP WANTED

THE Boulder dam. Eight year's work. Latest information regarding conditions, employment, concessions, etc., sent by return mail for \$1.00. Money back if dissatisfied. M. Roberts Service Bureau, Box 1051, Denver, Colo.

WANTED: Women who need quick money. "New Idea" imported ladies' necessity sells on sight; everyone buys; representatives everywhere are cashing in big. Miss Ely has made \$1900; Mrs. Hart \$2200, without experience. New salesplan put you in business for yourself. Sample free. Write Mary P. Coleman, Meriden, Conn.

CASH Paid for Butterflies, Insects. See Sinclair Display Advertisement on page 24.

BIG Wages paid in Canada for construction work, etc. Write for list of positions. Stamp appreciated. A. Allard, 4724 Des Erables, Montreal, Can.

SILVERING Mirrors. French plate, patented process, easily learned. Immense profits. Plans free. Wear, Excelsior Springs, Mo.

OBTAIN Employment! Get best positions quickly anywhere. Learn how. Request free offer. Write Box 29-101, Station K, New York.

EDUCATIONAL AND INSTRUCTION

WANT A government job? \$105.00 to \$280.00 month. Steady work. Short hours. Paid summer vacation. Common education usually sufficient. Experience unnecessary. 25 men—women, 18 to 50 coached free. We coach you without leaving home. 32 page book with full particulars free. Write immediately. Franklin Institute, Dept. S3, Rochester, N. Y.

FIREMEN, Brakemen, baggagemen (white or colored). Sleeping Car, Train Porters (colored). \$150—\$350 monthly. Experience unnecessary. 810 Railway Bureau, East St. Louis, Ill.

TRACE Missing people. Excellent paying work. Open to all. Write National Headquarters, 169 East 83rd, New York.

BECOME Automobile mechanics. Hundreds positions. \$24.00 week up. Sample training free. Franklin Institute, Dept. 400, Rochester, N. Y.

INVESTIGATING And tracing. Work home or travel. Experience unnecessary. Write American System, 2188 Broadway, N. Y.

LEARN Linotype—Pays good salary; home or college course; small cost; free catalog. Linotype School, Maumee, Ohio.

WANT A government job? \$105.00—\$280.00 month. Steady work. Short hours. Paid vacations. Experience usually unnecessary. 25 men—boys, 18 to 50, coached free. 32-page book with particulars free. Write today sure. Franklin Institute, Dept. S14, Rochester, N. Y.

STUDY A scientific profession. Microbiology. Bacteriology. Sanitation. Extension-residential course. Diplomas, degrees granted. Urinalysis outfit—prospects free. College of Microbiology, 23 State, Hammond, Ind.

BECOME A cosmetic chemist at home in few weeks. Earn \$50 to \$200 a week. New profession. Diploma issued. Positions everywhere. National School of Cosmetic Chemistry, 2985 West 15th St., Los Angeles, Calif.

DON'T Prepare for any civil service examination without seeing our catalog. Free. Columbian Correspondence College, Washington, D. C.

BIG Money in Real Estate business. Our complete guaranteed twenty lesson course shows you how. Only \$2. Real Estate Sales Co., Box 1, Everett, Wash.

LEARN Retail shoe selling. Stores everywhere need men. Fine positions! Excellent pay! Write, Shoecraft, 36 Lefferts Place, Brooklyn, New York.

ART. Earn \$100.00 weekly in commercial art. Satisfaction guaranteed or money back. Complete art course, cartooning, illustration posters, advertising, 120-page reference book, supplies. Send no money, pay postman \$2.98 plus postage. No more to pay. Studio, 156 Somerset, New Brunswick, N. J.

HIG Demand for photoplay talking picture and magazine stories. We revise, develop and copyright. Sell on commission. Established 1917. Booklet free. Universal Scenario Company, 406 Western and Santa Monica Bldg., Hollywood, Calif.

AMATEUR Cartoonists: Sell your cartoons. New market. Smith's Service, PR-1194, Wenatchee, Wash.

BECOME A landscape architect. Uncrowded profession; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 29 Plymouth Bldg., Des Moines, Iowa.

WANTED Immediately, men-women, 18-55 qualify for government position, \$125-\$250 month. No experience required. Steady work. Vacations with full pay. Write, Ozment Inst., 101 St. Louis, Mo.

U. S. GOVERNMENT wants men, \$1,700-\$1,900 and up at start. Railway mail clerk examination coming. Let our expert (former government examiner) prepare you for this and also rural carrier, post office, customs, internal revenue, and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

BIG Money in photography, motion picture projection. Catalog 49A free. New York Institute of Photography, 10 W. 33d St., New York.

DOUBLE Entry bookkeeping 60 hours with 8 keys; guaranteed. (Diplomas.) International Bookkeeping Inst., 8 Springfield, Mo.

10,000 FORMULAS. A real Gold Mine of money-making ideas. Tells how to make almost everything under the sun. You can make and sell cosmetics, liniments, anti-freeze solutions, battery solutions, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send No Money. Just write a postal for "Henley's 20th Century Book of Formulas." Pay postman postage and \$4. Popular Mechanics Press, 200 E. Ontario St., Room 806, Chicago, Ill.

INFORMATION, SERVICE, COUNSEL

W. SCOTT WILKERSON, 602 Westory Bldg., Washington, D. C.

DETAILED Information, advice, any subject, 25c. Money back if we cannot answer. Julius Goldin, 926 Southern Blvd., New York.

TRACING. Make secret investigations. Work home or travel. Experience unnecessary. Write, American System, 2188 Broadway, N. Y.

ELECTROPLATING. New printing of popular book by H. C. Reetz. Complete instructions for plating with all kinds of metals. Send no money. Just write a postal asking for "Electroplating." Pay postman the postage and \$1.00. Popular Mechanics Press, Room 806, 200 E. Ontario St., Chicago, Ill.

TYPEWRITERS AND SUPPLIES

TWO Typewriter ribbons 85c. Miller, 628 North Eighth, Allentown, Pa.

TYPEWRITERS. Motorcycles, Radios, \$9.99-\$39.99, terms, Knights, 1516 Locust, St. Louis, Mo.

TYPEWRITERS—Factory rebuilt Royals, Remingtons, Underwoods, New Royal, Remington and Corona portables. New "Excellograph" Rotary Stencil Duplicator \$37.50. Catalog free. Pittsburgh Typewriter Supply, Dept. 945, Pittsburgh, Penna.

TYPEWRITERS, all standard makes, \$10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Typewriter Exchange, 121 N. Francisco Ave., Chicago.

ADDING MACHINES

NEW \$3.50 Automatic adding machine. Adds, subtracts, multiplies, absolutely accurate. Capacity \$999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates mistakes. Saves time. Postpaid \$3.50. Bassett Co., 1438-A, Hollywood Ave., Chicago.

PRINTING, ENGRAVING AND MULTIGRAPHING

500 MIMEOGRAPHED Typewritten letters, excellent bond paper, three dollars prepaid. Chicago Lettergraph, 542 North Ave., Chicago.

MAKE Your own printing device. It's practical—it's different! Particulars, printed specimens free. Grinstead Company, Oswego, Kans.

1,000 BUSINESS Cards \$1.65. Cash with order. Tick, 2338 Arkansas St., Oakland, Calif.

SPECIAL Offer—150 8½x11 letterheads and envelopes printed, \$1.50. J. Ferreira, 249 Eugenia St., New Bedford, Mass.

FINE Printing—Low prices. Large modern plant (thirty employees) in small town, low operation cost. Special prices on stationery, circulars, pamphlets, ruled forms, catalogs, large or small orders. Write for samples and prices. Shenandoah Publishing House, Inc., Box 1080, Strasburg, Va.

PRINTING. Properly produced, promptly, reasonably. Price list, samples on request. Moulton Press, 1410-P, E. 8th, Kansas City, Mo.

1000 BUSINESS Cards \$2.75 postpaid. Samples free. John Miller, Montgomery Avenue, Narberth, Pa.

QUALITY Stationery, 500 8½x11 Bond Letterheads, 250 6¼ envelopes, \$3.25. Satisfaction. Samples, H. Curtis, 811 Harrison, Kalamazoo, Mich.

500 HAMMERMILL Bond letterheads or envelopes \$2. Patton Company, 534 Paxton Block, Omaha, Neb.

SPECIAL. 400 Attractive 5½x8½ Bond Letterheads, four line copy \$1.00. Artcraft, Chillicothe, Mo.

5,000 ELEGANT Enamel folders \$12.75; 5,000, 5½x8½ circulars, \$10.00; envelope slips, \$5.00. Samples. Goodprint, Harrisonburg, Va.

100 LETTERHEADS. 100 Envelopes neatly printed, postpaid, \$1.00. James Pierce, 6138 Iroquois, Detroit, Mich.

NEARGRAVURE. "Neargravure" processes. Special—Neargravure, 250 envelopes, 500 8½x11½ letterheads \$3.33—8½x11" \$4.44, postpaid. Solidays, Knox, Ind.

FINEST Bond letterheads 8½x11, \$3.95m. Envelopes, \$2.95. Oberman Company, Box 1042, Chicago.

MULTIGRAPHING—Expert work. Get prices, samples. Box 1071, Knoxville, Tenn.

FREE—Samples of our printing and price list. Letter Service, 4010 East 15th, Kansas City, Mo.

SAMPLES Raised letter printing with special prices free. LaClyde Service, Westfield, Mass.

200 LETTERHEADS And 100 envelopes \$1.00. 200 letterheads, 8½x11, 150 envelopes \$2.00. 250 cards \$1.00. Hensler Print Shop, Portland, Ind.

QUALITY Printing! Reasonable Prices! Send for Free Standardized samples and prices. Folders, Circulars, Catalogs our specialty. Earnest Fantus, 525 South Dearborn, Chicago.

MULTIGRAPHING Business correspondence two dollars thousand. Hammermill letterheads, four dollars; inexpensive quality, three dollars. Miscellaneous printing. Mayers Corporation, Monmouth, Ill.

250 BOND Letterheads, Envelopes, Billheads, Cards, \$1.35 each. Economic Press, Leonia, N. J.

WE Print stationery, booklets, catalogs, circulars. Samples. Commercial Press, Batavia, Ohio.

PRINTING OUTFITS

PRINT Your own stationery, cards, bookplates, Christmas cards, circulars, book, pamphlets, etc. Junior Press \$5.90, large, \$11; rotary, \$149. Print for others. Easy and interesting; rules sent. Write for catalogue presses. Type, paper, etc. Kelsey Company, L-11, Meriden, Conn.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

GUMMED LABELS

1,000 PRINTED: Name, business address 50c. JDS Company, Box 93, Holyoke, Mass.

DUPLICATORS AND DEVICES

STENCIL Duplicator—Anyone can make. Particulars, specimens free. Grinstead Company, Oswego, Kans.

YOU can make 50 to 100 copies of a letter, notice, etc., at a cost of three cents on a Hoyer Quality Duplicator. Write for free trial offer. The Hoyer Duplicator Co., 909 Jackson Blvd., Chicago, Ill.

"EXCELLOGRAPH" Portable rotary stencil printing duplicators \$39. Terms. Description, testimonials, printed samples, free. Pittsburgh Typewriter Supply Co., Dept. 331, Pittsburgh, Pa.

RUBBER STAMPS

MUSIC Stamps, metal badges, trade checks, catalogue 40c. Walt. Karstaedt, Dayton, Ohio.

MAILING LISTS

1000—1929 Iowa Farmers' names, \$1.00. J. Mitchell, 2833 Marmora Ave., Chicago, Ill.

JUST Compiled: 1000—1929 (men) mail order list, \$1.00. National Sales, Box 691, Chicago.

1,000 FRESH Rural women names, \$1.00. Sheasgreen, PM1427 North Penn, Minneapolis, Minn.

FOR THE HOME

GRANDFATHER'S Clock Works, \$5.00. Build your own case; instructions free; make good profits selling your friends. Clock works with chimes for old or new cases. Write for full particulars. Clock Co., Ruffner St., Philadelphia.

DON'T Discard old straw hats: Write for free bulletin M telling how to make and keep them like new. Agents wanted. The Krolac Corporation, 100 Fifth Ave., New York City.

NEW Invention—Sharpens lawn mower in five minutes. Koch's Klean Kut Sharpener does the trick; positively accurate. State size mower. Prepaid, 75c. Agents wanted. Klean Kut, Box 573, St. Paul, Minn.

AUTOMATIC Hot Water Control System, with remote button control, complete \$14.00. Nothing like it. Lapointe Products Co., Ann Arbor, Mich.

CEDAR chests only \$11.65—"Red-I-Kut" complete with rich copper trim—you assemble and save half—send for pictures. Kuempel Furniture Company, Guttenberg, Iowa.

BUY Direct from manufacturer. Mexican curios, den fixtures, Indian sarapes, rugs, novelties, cushion covers, Bed-rock prices. Samples fifty cents. G. Medina, 78-P La-Rosa St., Mexico City, Mexico. References furnished.

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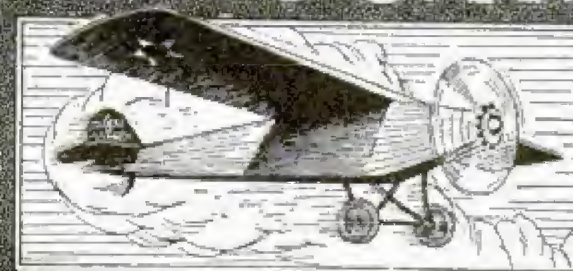
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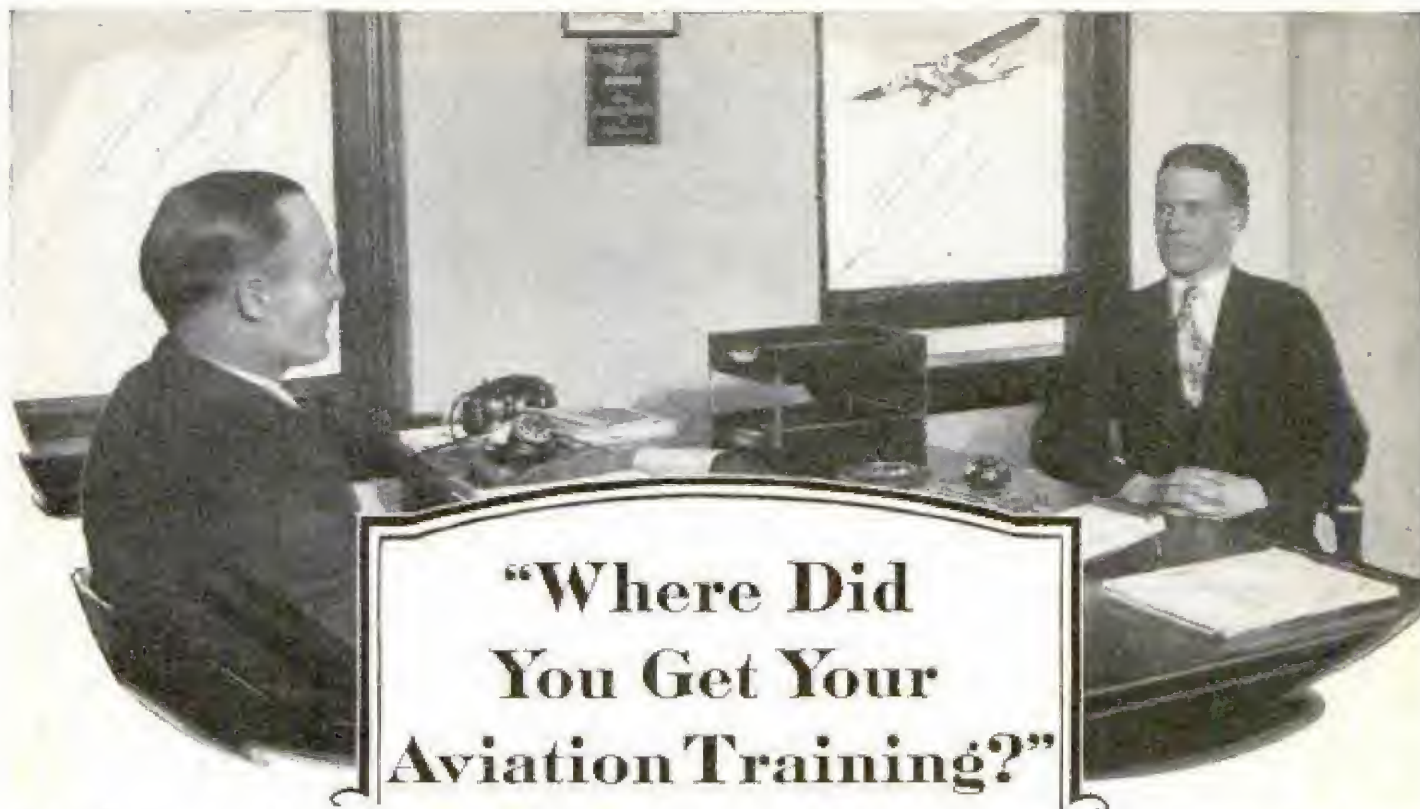
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State of Illinois, County of Cook, ss.
Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, deposes and says that he is the editor and business manager of the Popular Mechanics Magazine and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: First. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Popular Mechanics Co., 200 East Ontario St., Chicago, Ill. Editor, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Managing Editor, L. K. Weber, 200 East Ontario St., Chicago, Ill. Business Manager, H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Second. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) L. H. Windsor, 200 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 200 East Ontario St., Chicago, Ill. Third. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, in view; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Publisher. Sworn to and subscribed before me this 28th day of March, 1929. J. GRAHAM, Notary Public. (My commission expires June 16, 1932.)

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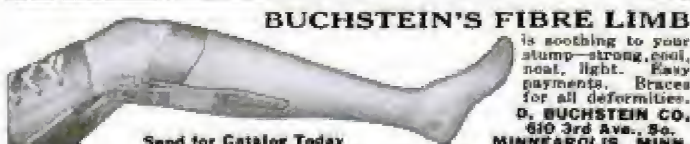
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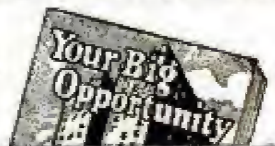
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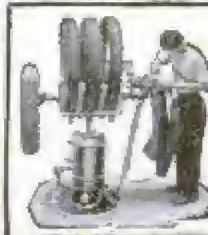
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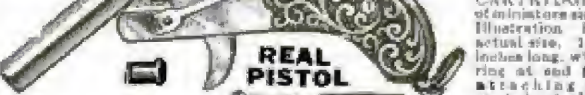
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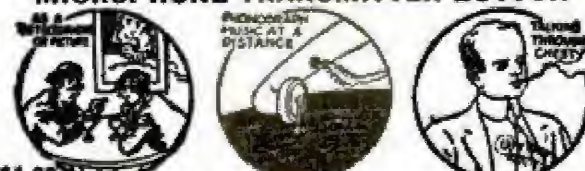
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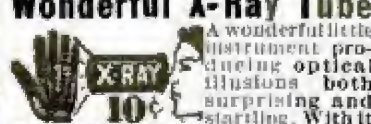


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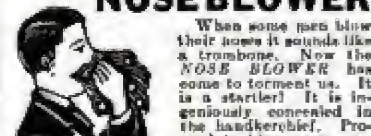
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is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful DOUBLE



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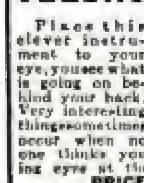
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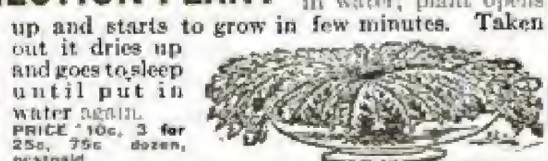
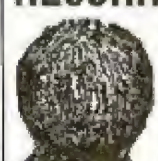
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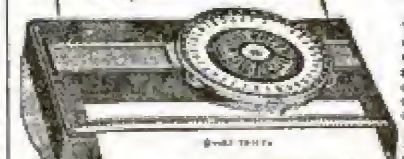


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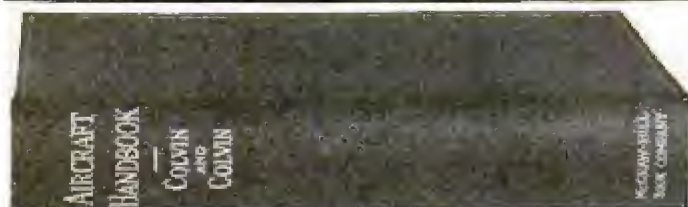
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This queer little device doesn't just chop a ragged hole in the top of the can. It cuts the entire top completely out, clean as a whistle! The machine takes hold of the can—opens it—flips up the lid so you can grab it—and gives it back without any sharp edges to snag your fingers. You just put the can in the machine—turn the handle—and almost instantly the job is done!

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Everyone knows how women detest the dangerous old-style can opener. Imagine, then, how

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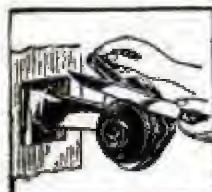
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That is because you haven't as yet, perhaps, felt the effects of the nicotine poison in YOUR system. For you know that nicotine, as absorbed into the system through smoking and chewing tobacco, is a slow working poison. Slow, yes—but sure.

Tobacco is lowering your efficiency. It slows a man down. Makes it harder for you to concentrate your mind on your work. You haven't near the amount of "pep" and energy you would have if you stopped using it. There's many a man twice as old as you in years who's twice as young in energy, simply because he lets tobacco alone.

Some day you will realize to what an alarming extent tobacco has undermined your system.

When your hands begin to tremble—
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and your heart seems to "skip a beat" now and then—
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then you have a right to suspect that
TOBACCO is getting the upper hand.

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And YOU know that the use of tobacco in any form is an expensive, utterly useless habit. You know you ought to quit.

Tobacco Habit Banished

Let Us Help You

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it—whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—**Tobacco Redeemer** will positively remove all craving for tobacco in any form in a very few days. Not the slightest shock to the nervous system. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

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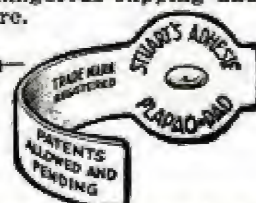


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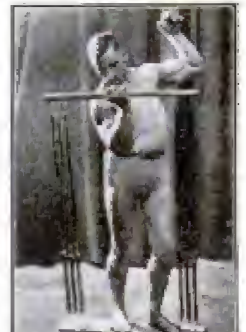
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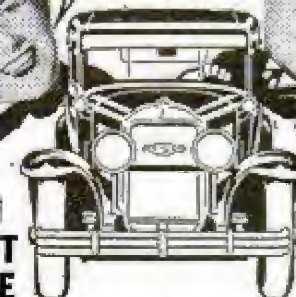
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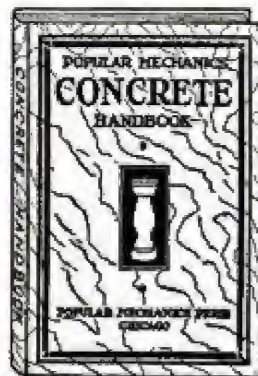
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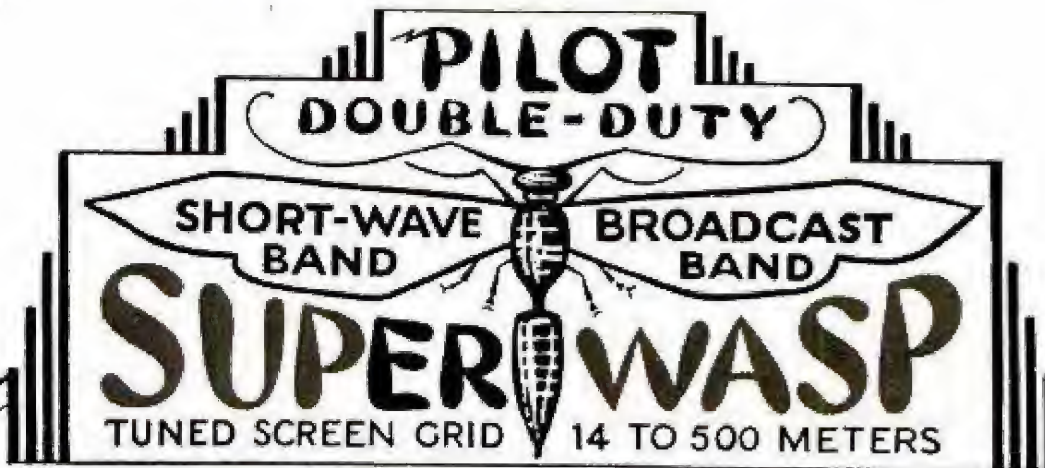
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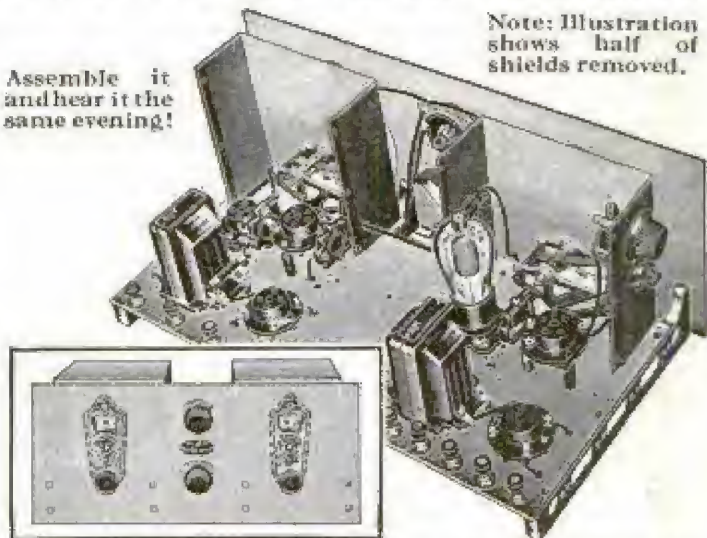
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Note: Illustration shows half of shields removed.



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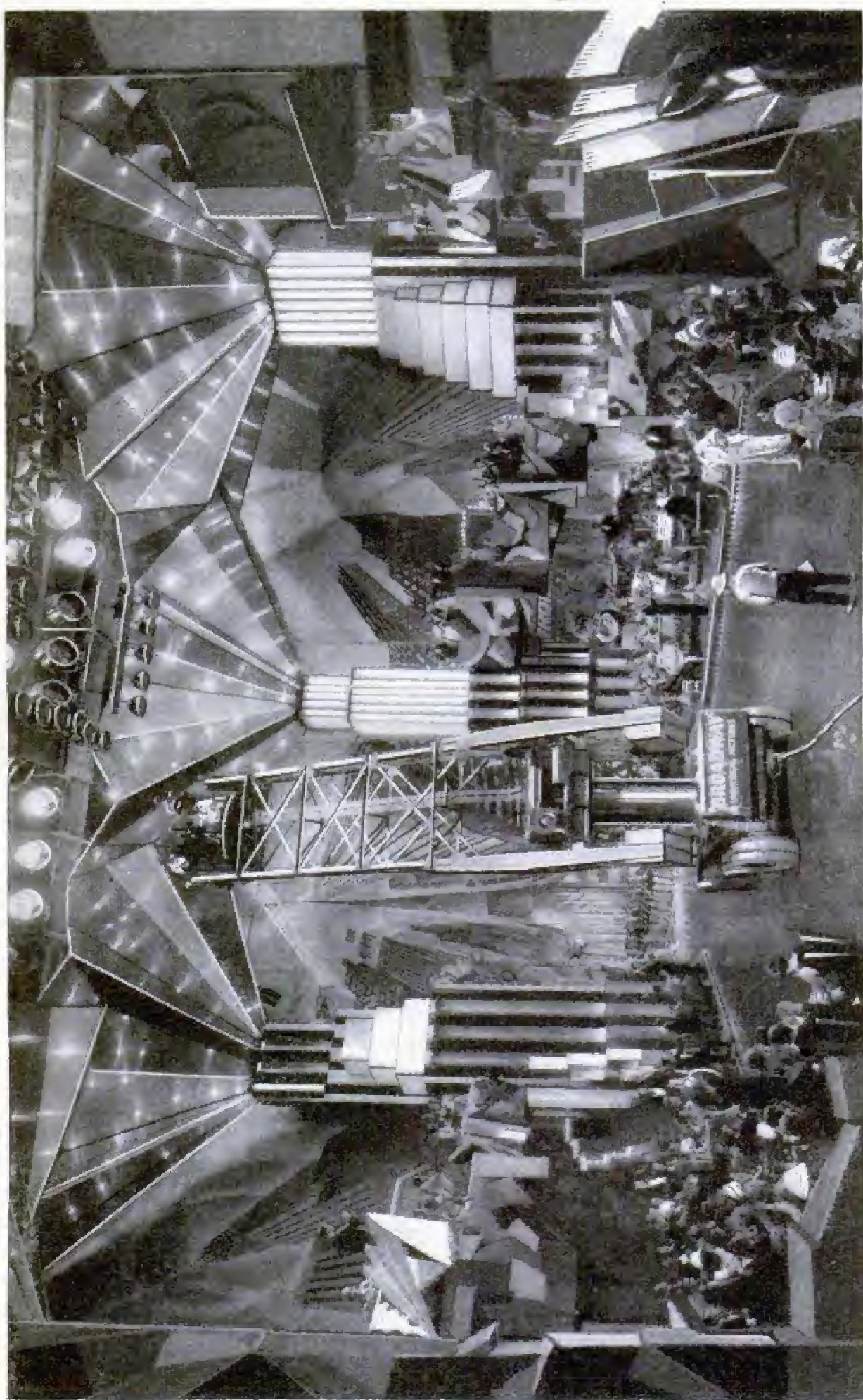
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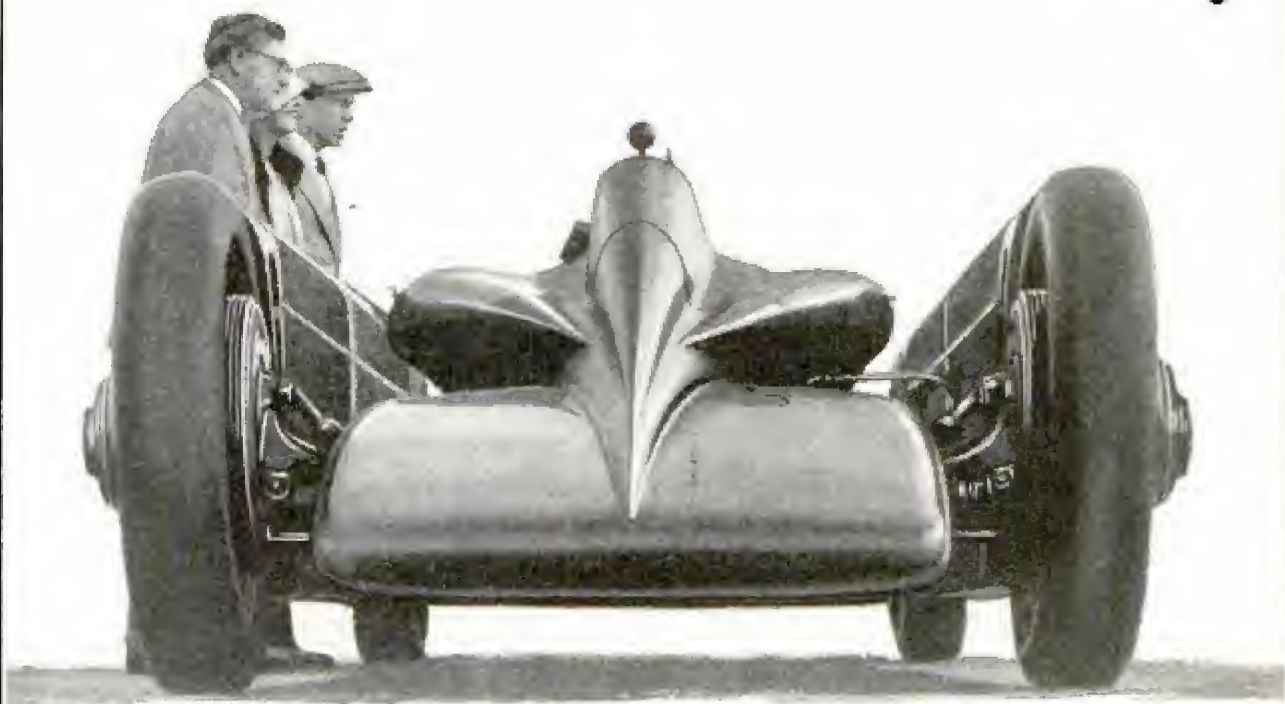
Vol. 51

JUNE, 1929

No. 6

26/4

What Price Speed?



Pared Down to a Shadow. Yet Holding a Motor of Terrific Power, the Super-Streamlined "Golden Arrow" Shot along at Record Speed Partly Because Its Design Reduced Restraining Vacuums to a Minimum

THE SPECTACULAR record of 231.-3624 miles per hour, established at Daytona Beach by Maj. H. O. D. Segrave, the British auto racer, is the result of developments in high-speed cars. It is now believed by those who have watched the effort to develop great power in cars of low wind resistance that this record can be broken by a high margin, although the tests are so extremely perilous that it may be years before anyone attempts to do so.

Records of 250, or even 300, miles an hour are considered likely, and one of the foremost designers has stated he believes 500 miles an hour is not beyond possibility. The present record, however, is somewhere near the top of that which can be attained on an eleven-mile course such as

that staked off on Daytona Beach, which gives five miles to attain maximum velocity, one mile at top speed, and five miles to slow down to a stop. It is thought that more of the Daytona Beach course can be used for racing, allowing cars to reach 250 to 300 miles an hour.

Both of the two cars that have ended their wild race in wreckage and death and all the three which have added a new high record for fast time on land, have contributed something of value to the science of high-speed racing. Major Segrave's "Golden Arrow" represents the highest present development of that science. It is a branch of automobile engineering that is quite distinct from the manufacture of ordinary tourist or racing cars. Terrific

strains must be withstood by every part of the car, the engine, and the tires. But it leads the way for improvement.

The development of tires to stand the terrific heat and stress is a case in point. When Major Segrave, in 1927, for the first time exceeded a speed of 200 miles an hour, setting the world's record at 203.79 in his giant "Mystery S," the problem of tires was one of grave concern. For months, experts had worked to perfect tires that would stand the enormous centrifugal force, the intense heat, and strain. But the "Mystery S's" tires showed almost no wear. Starting with the "Mystery S," the first car to exceed the 200-mile-an-hour mark, consider the development of the modern high-velocity racing automobile as exemplified in the "Golden Arrow."

The "Mystery S," first of the superspeed creations, was designed by Louis Coatalen and built by a British motor-car company at a cost of \$100,000. The car weighed over three tons. Two twelve-cylinder aviation engines, in front and rear, between which was the driver's seat, delivered more than 1,000 horsepower.

The "Mystery S" was not well streamlined. But despite this drawback, as it was the most powerful automobile in the world up to that time, it came out with a world's record. It was evident, however, that the poor streamlining held the car below the ground speed which its engines were expected to deliver. As a result, three cars, two American and one British, were built, the four-ton thirty-six cylindered "Triplex," which strove entirely for power and ignored streamline design, the late Frank Lockhart's 2,900-pound "Stutz Special," a tiny car, which was the refinement

of streamlining, and Capt. Malcolm Campbell's "Bluebird," a British car, developing about 900 horsepower.

The "Triplex," which was calculated to develop from 1,500 to 2,000 horsepower, was the most powerfully engined car ever built. Under ideal weather and beach conditions, it might have been the fastest car, as it was calculated to do 253 miles an hour, allowing ten miles an hour loss for slippage. But although very heavy and powerful, the "Triplex" was not designed to compete with the furious hurricanes, cross currents of air and back-vacuum pulls which a superspeed car encounters.

The little Lockhart car, on the other hand, was very small and shaped like a cigar. But even with its relatively small engine, it developed almost 450 horsepower and a speed of over 202 miles an hour, since it had to overcome only a relatively slight wind resistance. Its cylinder capacity was ninety-one cubic inches, and the power was derived from the high speed of the engine, which wound up to 7,500 revolutions per minute. It was, however, too light, in the opinion of many, for such terrific speed as it was capable of attaining.

Midway between these two cars was Capt. Malcolm Campbell's "Bluebird," winner of the speed trials in February, 1928, with a record of 206.89 miles per hour. The "Bluebird," which bested Major Segrave's first record, was a finely streamlined car of moderate proportions with probably as powerful an engine as could be placed in a car of its size, developing 950 horsepower. It was bested two months after winning by the gigantic "Triplex," which made 207.55 miles per hour. The "Bluebird"

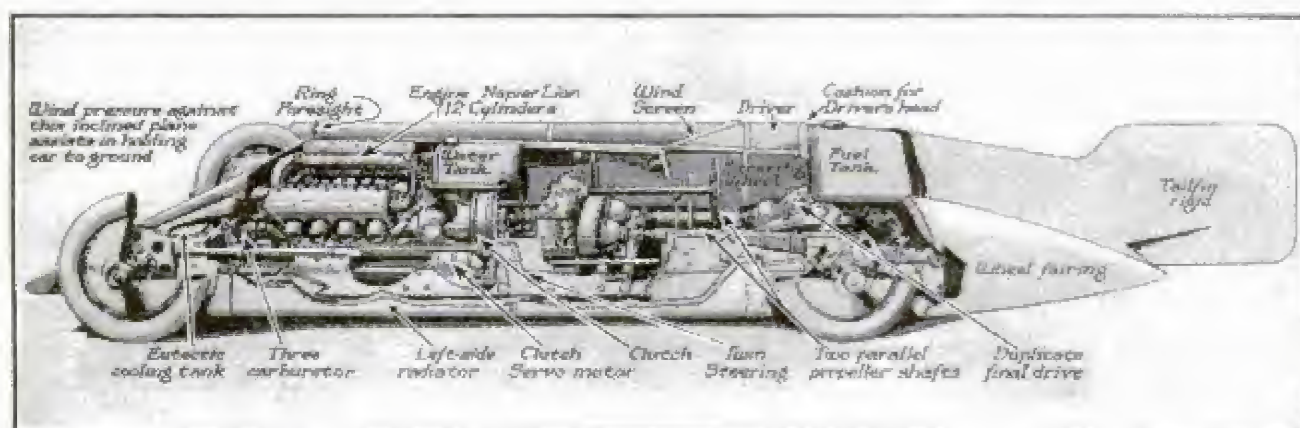
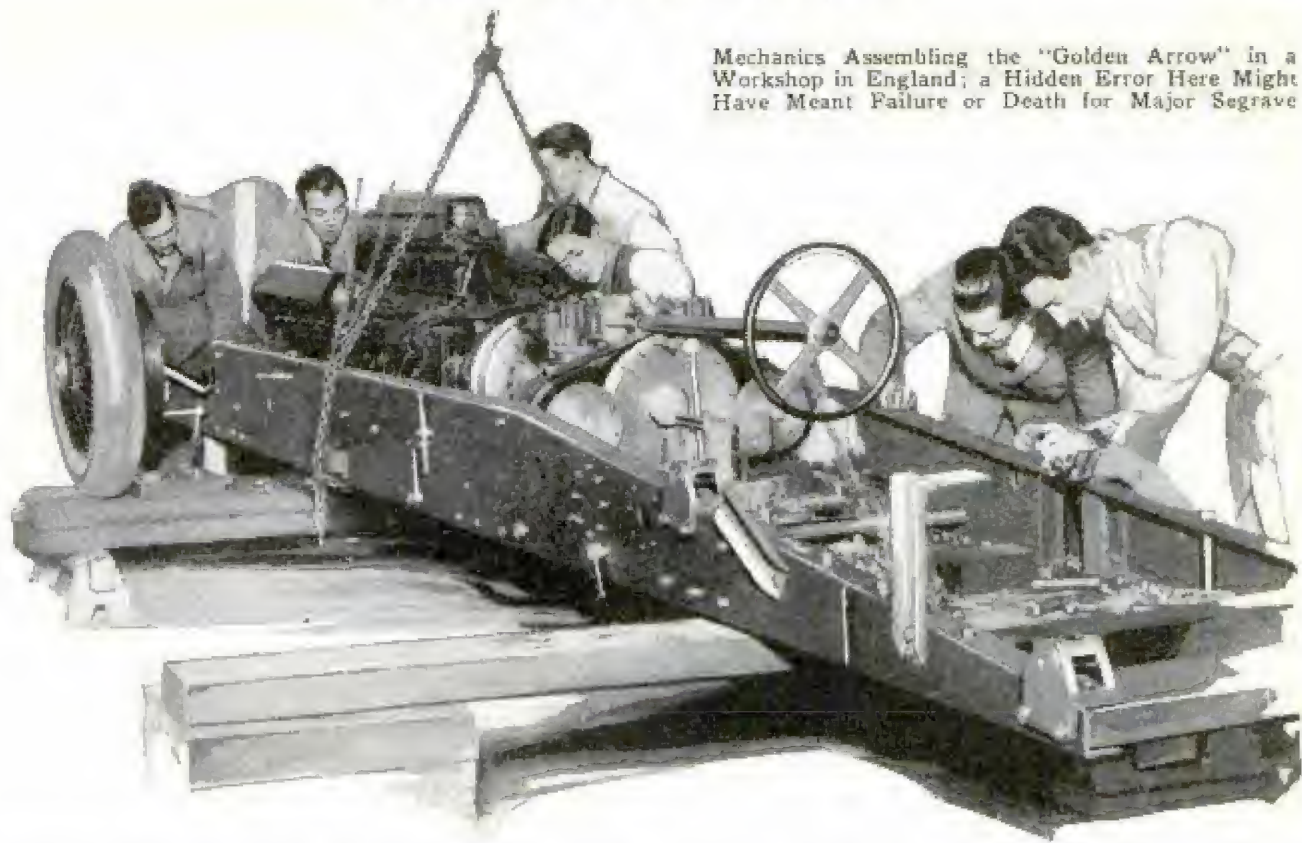


Diagram of the "Arrow's" Most Interesting Secrets; Note Especially the Incline at the Front That Provided Wind Pressure for Holding the Car to the Ground

Mechanics Assembling the "Golden Arrow" in a Workshop in England; a Hidden Error Here Might Have Meant Failure or Death for Major Segrave



was so designed that the wind would tend to hold it on the ground, a vital point. From these three cars, four facts of prime importance became evident:

First, that great power was required, since a powerful car even without streamlining had won the record; the air resistance, by the way, increases as the cube of the speed, which calls for tremendous reserve power when bucking a stone wall of wind.

Second, that streamline design could not be ignored, since the well-designed "Bluebird" came very close to the record of the much more powerful "Triplex" and, in fact, had won the world's one-way speed record.

Third, that the effort to minimize wind resistance could not be carried to the extent of greatly reducing the weight and hence the stability of the car.

Fourth, that engines of a high turnover, which would keep winding up and increasing speed, were desirable, as the "Triplex" with its large cylinders would decrease in speed after 2,300 revolutions per minute.

The results of this demonstration were apparent in the "Golden Arrow." Future racers, with engines in tandem, that develop still greater power than the "Golden Arrow," but offer less wind resistance, yet

possess weight and design to hold them to the ground, will probably some day be built to shatter the "Golden Arrow's" record by a great margin.

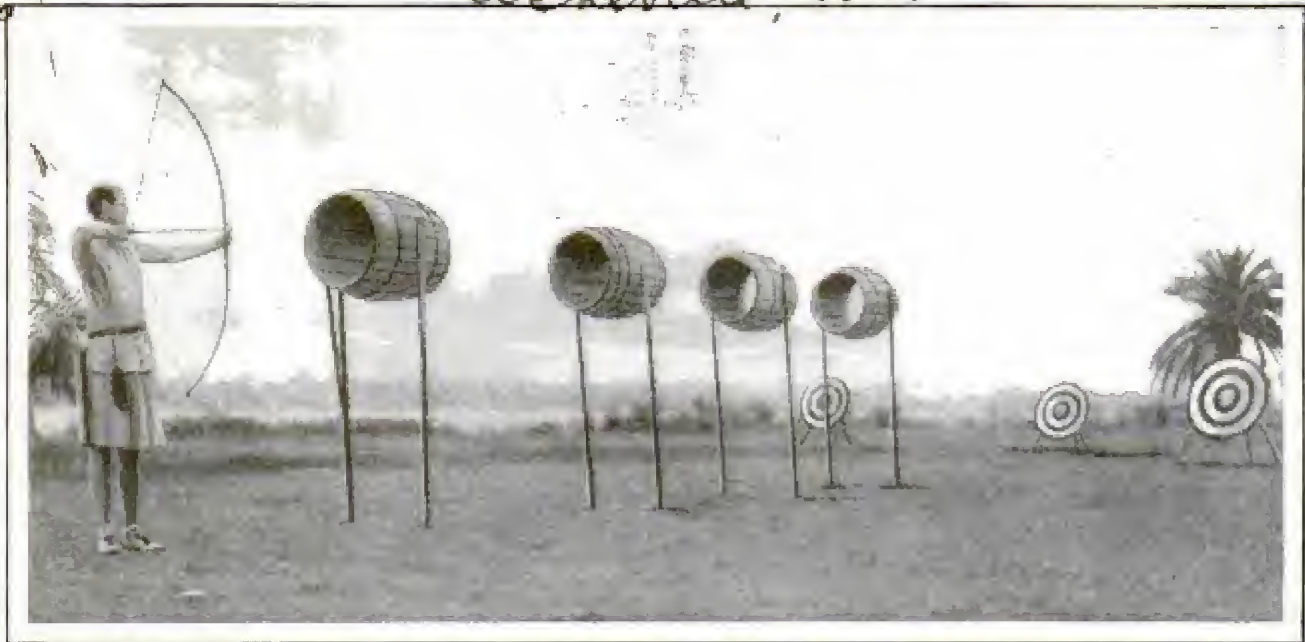
Coupled with this great reserve of power, which provided continued acceleration until the maximum was reached, was the design of the "Golden Arrow" to encounter a relatively very low wind resistance, and the fact that the big car weighed two and one-half tons and was less than four feet high, sitting close to the ground. These qualities make for high speed and stability.

In low gear, Major Segrave's highest speed was eighty-one miles an hour; in second, 166 miles an hour, and in high, 246 miles. The "Golden Arrow" was especially designed to meet the problems of aerodynamics which face drivers of the latest high-speed racers.

The engine of the "Golden Arrow" weighed almost 1,000 pounds. The steel frame was enormously strong. Its springs were very stiff so that they would not give, should the car leap on striking some slight irregularity in the sand. As a whole, the car is cigar-shaped and, with its long projecting tail, has an over-all length of twenty-six feet. The engine is of the same type as that in the "Bluebird," Capt. Malcolm Campbell's famous racer.

Mass. Archery Co.
Archer's Company
 POPULAR MECHANICS
Asheville, N.C.

*Letter
 recd.*



Making Archery More Difficult: Sending Her Arrows through the Four Barrels, This Woman Scored Five Bull's-Eyes in Six Shots

Wide World

SHOTS THROUGH FOUR BARRELS SHOW ARCHER'S SKILL

Arrows sped from the bow of a woman archer, shot through four open barrels and struck five bull's-eyes in six attempts, during a recent test at a Florida resort. The facts that the barrels were not of great diameter and that the arrows described an arc during their course, emphasized the woman's accuracy and skill.

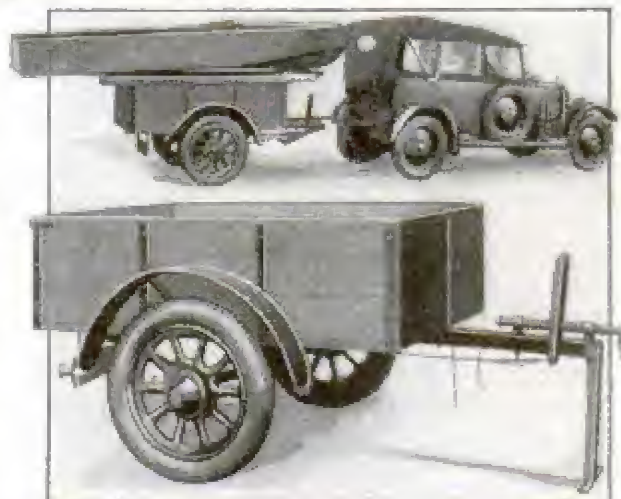
AUTOMATIC BRAKES ON TRAILER STOP BOTH WHEELS

An auto trailer with automatic brake drums on both wheels is being marketed in England. The trailer has a box body to carry camping equipment, and can be fitted with blocks on top for the support of a canoe, rowboat or a small motorboat. The coupling bar is equipped with a spiral spring, and connected to it is a lever, the lower end of which is joined to the cables actuating the brakes. When the brakes of the automobile are applied, the momentum of the trailer carries it forward against the tension

of the coil spring. When it has moved a couple of inches, the lever brings the brakes of the trailer into play. As the towing auto starts again and picks up the load, the action is reversed and the trailer brakes released.

BOTTLES HELP SOLVE MYSTERY 2606 OF OCEAN CURRENTS

Released in the Pacific ocean some 1,200 miles north of the Fiji islands, a bottle was picked up recently by a steamer crew off the coast of Queensland, 2,500 miles from the place where it had been set adrift. The bottle was sent to London, where the papers inside were examined by the meteorological office and entries made in the records that are being kept of the currents from the data furnished by the bottles. Arrangements have been made with nearly 500 British sailing and steamships to throw over daily at sea, sealed bottles containing drift papers which the finder is asked to mail to the air ministry at London. Last March, one of these bottles was picked up on the beach off the coast of France which had



Trailer Equipped with Brakes That Operate in Unison with the Automobile Brakes

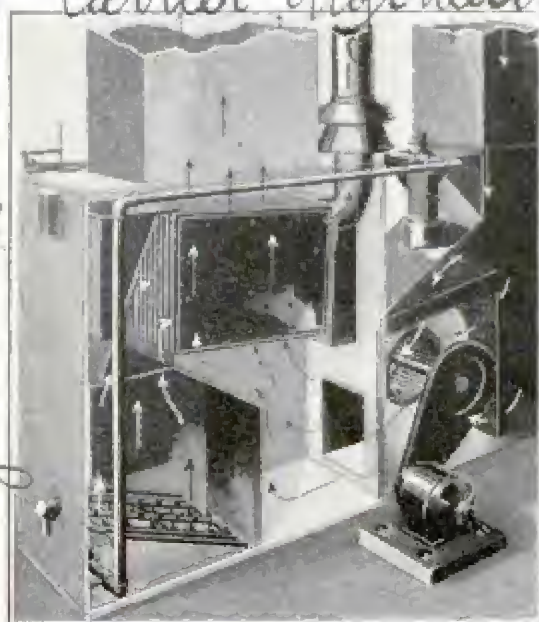
Wilkins

Thornton Engineering Co. Ltd. Bradford England
50 Birmingham Lane

been thrown into the sea July 20, 1927, by the captain of the White Star liner "Celtic," later wrecked on the Irish coast.

"WEATHER MAKER" FOR HOME KEEPS OUT DUST

Better health and more comfort in the home are objectives of an air-conditioning plant for domestic use, modeled closely after the larger outfits that have been employed for some time in theaters, etc. It filters, heats, humidifies and circulates the air. The filtering system is designed to remove ninety-eight per cent of the dust which ordinarily floats through the house, lodging on furniture and menacing health. The heating is done entirely by gas and is controlled automatically. The humidifier, which supplies the air with the proper amount of moisture, is capable of evaporating several gallons of water a day, an important function when extreme cold outside demands more heat with the consequent likelihood of drying the air inside the house until it becomes unhealthful. Doctors and engineers have agreed that the air in the average American home, especially during the winter, is deficient in moisture much of the time. A survey showed that in the eastern part of the United States, the average humidity in a home on a winter day was ten to eighteen per cent. This is less than the average maintained in the usual kiln for drying lumber.



Air Conditioner for Domestic Use; It Filters, Heats and Humidifies the Air and Circulates It throughout the House



Attachment to Tennis Racket Allows Strings to Be Tightened or Loosened

TIGHTENER ON TENNIS RACKET LENGTHENS LIFE OF STRINGS

Strings on a tennis racket recently devised, can be loosened or tightened simply by turning a small handle at the base. This enables the player to reduce the strain on the strings after a game, and so prevent breakage.

CATAPULTS TO LAUNCH PLANES ON SMALL FIELDS

Adaptation of the catapult method of launching airplanes, the system used by the Wright brothers in their early try-outs with flying craft, may solve some of the landing-field problems of today, in the opinion of Maj. Alfred Hildebrandt, famous German flyer, who visualizes a return to the frequently ridiculed arrangements of the Wrights. A catapult, in improved form, would be useful in helping to launch heavily loaded ships, he declares, and would also be of service at the smaller airdromes, where lack of space renders impossible the construction of long runways.



Wills H. Carrier
Carrier Engineering Corp
Chicago 56 & W. Washington

Herald Examiner
3/31/29

2549 / *Liner. Patrucean- Hughes and Aircraft Corp. Bristol, Pa and*

Flying News from



Inclosed Motors, a Larger Cabin and Improved Streamline Design Feature This Recent Passenger Air Liner; at Left, a Big Fuel and Service Truck to Supply the Planes and Landing-Field Tanks



Building Model Planes Is Sport for Young and Old Alike, but Has Gained Importance from an Engineering Standpoint, Due to the Perfection of the Models

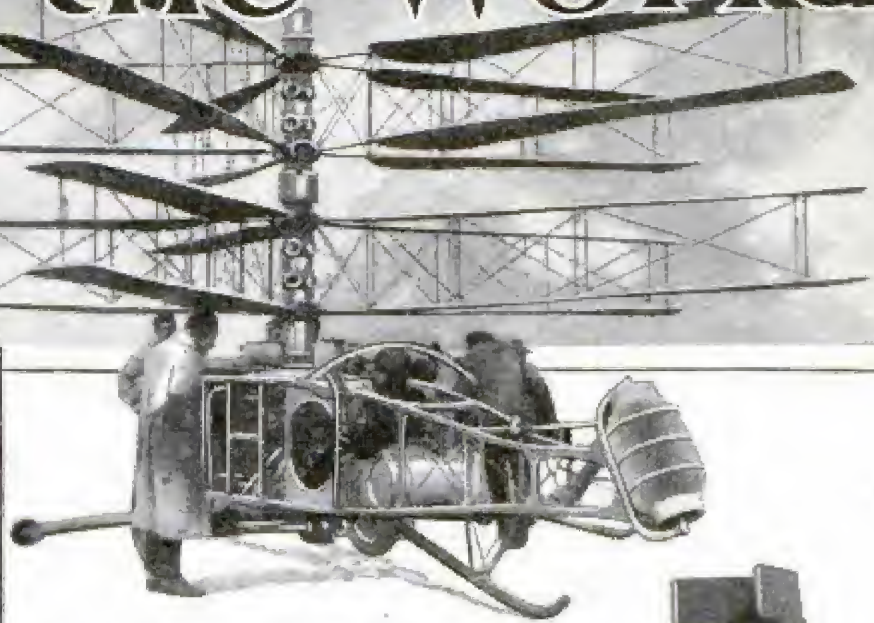
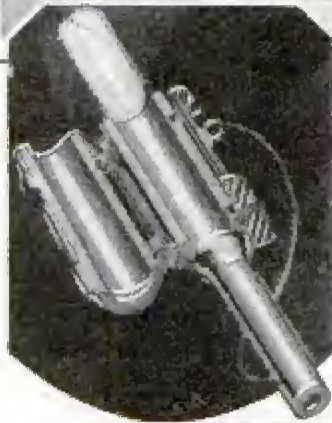


Tiny Compressed-Air Motor for Driving a Model Plane; It Will Turn at 1,500 Revolutions per Minute, Makes a Realistic Sound and Will Run for a Minute and a Half Wide-Open; It Is Supplied with Air from Special Tank Pumped Up by Electric or Hand Compressor

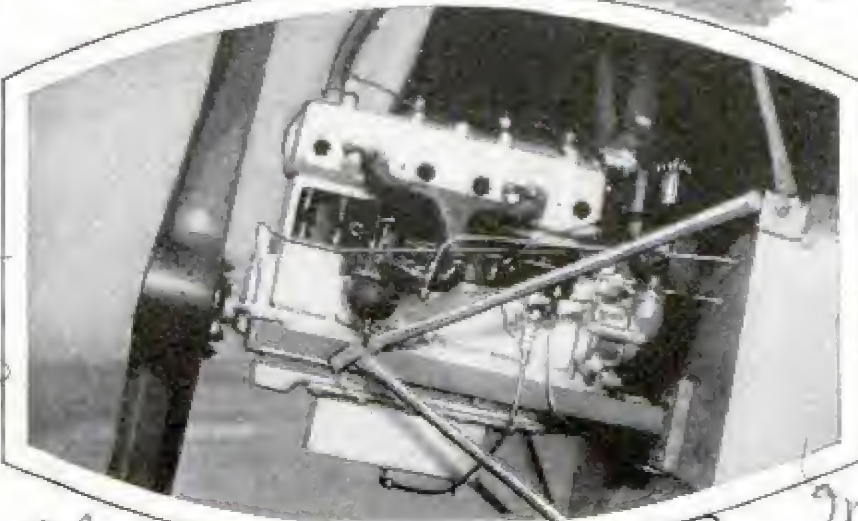
Miniature Aircraft Corp. 83 E. Terrace, New Brighton

Get, Amalgamated Sales & Service Corp. 542 W. Jackson Blvd. Chicago

All the World



Pescara Helicopter That Made Records in Vertical Flight. One of the Chief Aims of the Modern Aviation Engineer, and, Left, Bloxham Control Stick



Gliding Is Being Recommended as a Means of Learning the "Feel" of the Air and Becoming Familiar with the Controls; Here Is a Glider That Folds Up in Small Space; Its Designer, Maurice W. Collins, in Flying Suit, Has Made Successful Flights with the Craft, Which Has a Wing Spread of Thirty-Four Feet; at Left, Motor of a Flying "Flivver" with the Engine Cowl Removed, to Show Simplicity of Design and Compact Form; Air Flivvers Are Proving Successful When Conditions Are Favorable for Comparatively Little Power

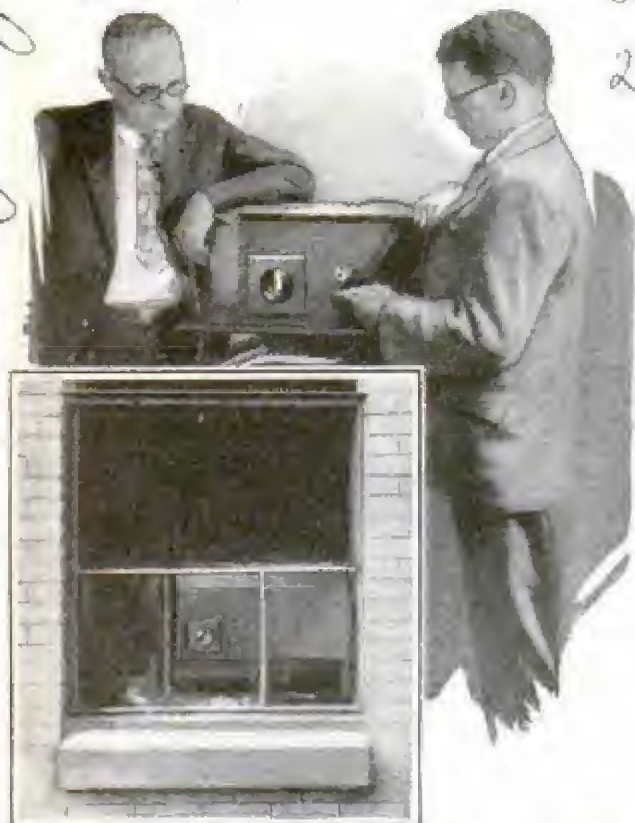
Flying Flivver

Plans and part of B. International Engineering Corp. 1111 1/2 Bldg Washington St
 Manager by def. Los Angeles store

PREDICT GOWNS OF ASBESTOS
FOR DURABLE WEAR

2586

Dresses of asbestos that will be as lustrous as silk and will give long wear, with ease in cleaning, are predicted by an eastern scientist. In view of the fact that fabrics are already being made from trees and vegetables and that the Romans made a sort of cloth from asbestos fibers centuries ago, this prophecy is considered entirely reasonable by experts. The use of asbestos in the early Roman days was confined largely to the weaving of shrouds. According to tradition, Charlemagne had a tablecloth of asbestos which was cleaned by throwing it into the fire. In the seventeenth century, Chinese merchants displayed asbestos handkerchiefs and the Eskimos in Labrador have used lampwicks made of an asbestos fabric for many years.



Inspecting the "Eye" Cabinet, and View of the Window with the Set Installed

ELECTRIC "EYE" TELLS WHEN
TO LIGHT SCHOOL

When natural light becomes too dim for reading without straining the eyes, a photoelectric cell, installed at an eastern school, snaps the inside lights on. The cell is contained in a small box, resembling a radio set, near a window, and connections are made to the electric switch. The light coming through the window is deflected, through a lens, upon the cell. As long as there is sufficient intensity, the unit remains inoperative, but as a certain carefully determined point is reached, when the light is too dim for the good of the pupils, the "eye" reacts upon an electric relay and the room lights flash on. Engineers point out that the plan is good in more than one respect. If the lights are left entirely to the teacher's discretion, pupils in a less brightly illuminated portion of the room may suffer eyestrain without her knowledge, and turning the lights on too soon wastes current. According to investigators, twenty-five per cent of high-school graduates are afflicted with impaired vision, and seventy-five per cent of this number owe their troubles to improper illumination in the schools.

WRECKED PLANE ON A GARAGE
ADVERTISES SERVICE

2565

Motorists journeying between Los Angeles and Hermosa Beach see what appears to be an airplane crash as they reach the peak of a hill. A ship evidently has dived, nose first, into the roof of a building. But the seeming wreck is only the clever device of an automobile-garage owner to attract attention to his service. He has mounted the wings and fuselage of an old JN-4 plane vertically on the top of his shop and just above his sign.



Old Plane Mounted at Front of Service Station, to Advertise Garage

Carl Math Weinstock
845 W. 102nd Place

General Electric Co., Schenectady, N.Y.

LATEST "V"-MOTOR BLOCK IS CAST IN ONE PIECE



Chassis of the New "V"-Eight; Diagram Showing the Air Intake and Circulating System, and the Finished Car



A "V"-type eight-cylinder engine, with the engine block cast in one piece, has just made its appearance in the automobile market. Another feature of the engine is that the valves are placed in a horizontal position, operated by a rocker direct from the camshaft, giving a semi-overhead-valve arrangement. Oil cleaning is accomplished by a "fish-ladder" arrangement, a series of cross strips in the bottom of the pan which trap foreign particles as the oil flows past. A further innovation is an air intake through a breather cap fitted with an air cleaner, on the side of the crankcase. Air, laden with moisture and oil spray, passes up a pipe running to the base of the carburetor air cleaner, and thence to the carburetor, an arrangement that is claimed to improve carburation. The mounting of the carburetor above the engine gives

a down draft to the cylinders. The intake valves are equally spaced from the carburetor to insure even distribution of fuel to all cylinders. The exhaust gas from the left side of the block is carried up over the intake manifold and carburetor vent, and a hot spot is provided to preheat the gases.

FIFTEEN MILLION TALK AT ONCE TO EQUAL HORSEPOWER

2588 It would require 15,000,000 persons, all speaking at once, to generate mechanical energy equal to one horsepower, according to the findings of Prof. Vern O. Knudsen, of the University of California, during research in acoustics. He measured the voice energy of speakers in rooms of varying sizes and used the results in preparing a formula for determining the acoustic rating of an interior.



Trimming Trees with the Aid of the Ladder Truck: the Steps Swing on a Turntable

TRUCK FOR TRIMMING TREES HAS AERIAL PLATFORM

Equipped with an adjustable ladder that can be elevated to various heights and swung at different angles, a truck for the use of tree trimmers, wire repair men, and other workers, is on the market. A particular advantage is that in repairing street lights, for instance, the ladder may be adjusted in such a way that other vehicles can pass under it, thus preventing any interference with street traffic. At the top of the ladder is a wide platform with rails to protect the worker. Instead of rungs, there are eight-inch steps, and the ladder works on a turntable which can be locked simply by pressing a lever.

FISH ARE FOUND BY ECHOES USED TO SOUND SEA

Echo-sounding instruments, such as were used during the World War to locate submarines and are now being employed in taking depth measurements and for other purposes in navigation, have been harnessed by fishermen on some of the English steam trawlers to locate places where the fishing is likely to be good. By means of the echo-sounding system,

shoals are easily located, and the skippers know that, generally, the fishing will be better at such places than farther out in the deeper waters. The echoes are also used to help guide the vessels when fogs obscure the vision.

SHOWER-BATH CABINET FITS ANY ROOM

Consisting of a leak-proof base and walls of porcelain-enameled iron, a shower-bath compartment now on the market is simple to install, saves space and reduces construction costs. The unit is not built in, but is separate and complete in itself, so that settling of the building walls and floors will not crack or damage the base of the compartment. The cabinet is furnished with either glass door or curtain.

SPECIAL CLOCK FOR TELEPHONE SAVES EXTRA TOLLS

To keep accurate check on the time consumed in talking over the long-distance telephone, a special clock has been introduced. It is set going simply by pressing a lever at the side, runs for six minutes and rings a bell at the expiration of three minutes and at the end of the total period. A large dial allows the talker to keep constant watch, so that he will be less likely to exceed the charge limit and will also obtain the full benefit of the period on which his charge is based. The clock is accurate, inclosed in a handsome nickel case and serves as a paper weight on the desk when not in use with the telephone.



Close View of the Dial, and Clock in Use with Telephone

Slogan Co.,
1893 Grand Mall

IMPROVED RADIO FOR PLANES ADDS TO SAFETY

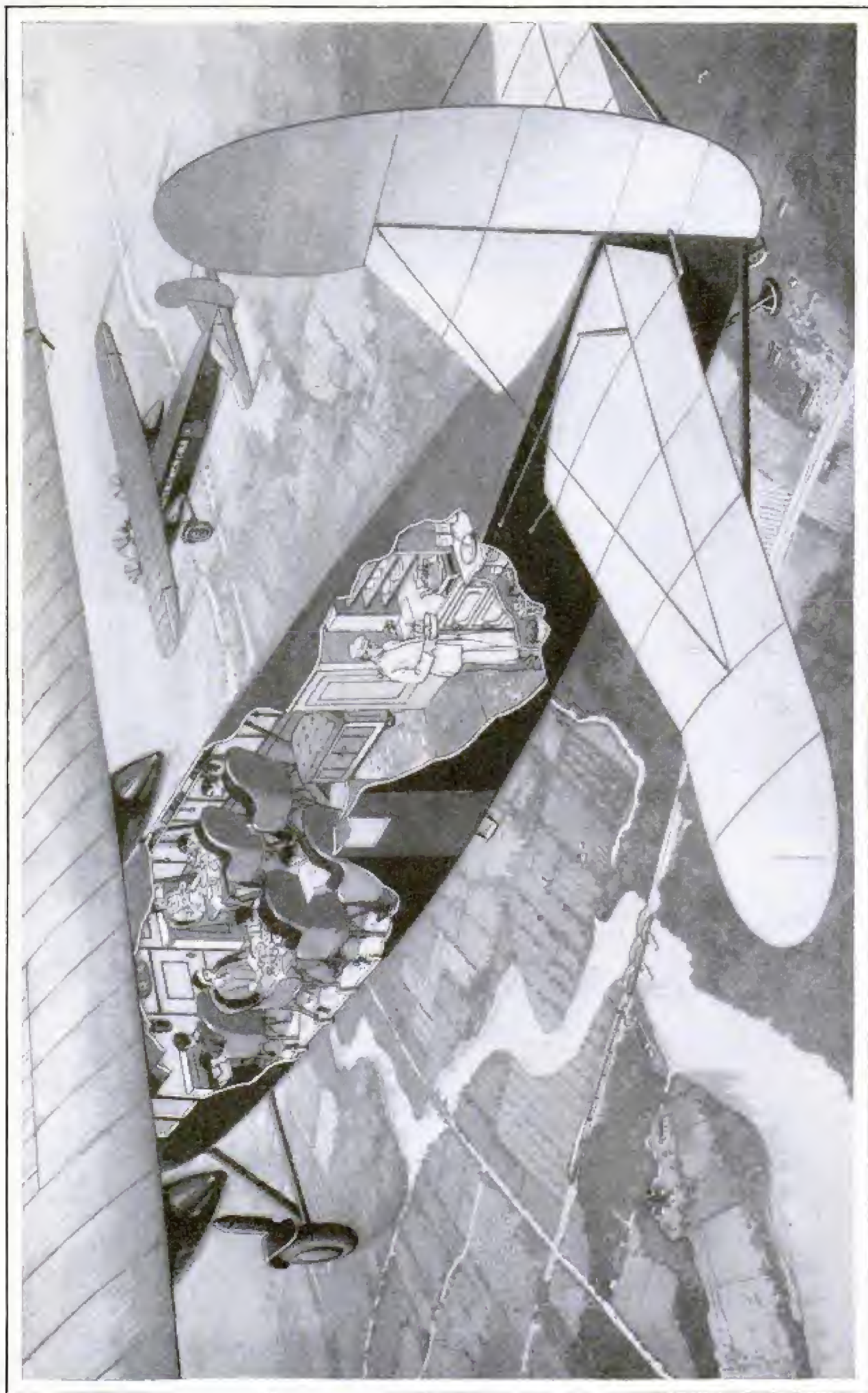


Plane Equipped with the Radio Aerial; Close View of the Receiving Set, and Interior of Transmitting Station

Bad weather and other perils of aviation will prove less bothersome over lines of the National Air Transport, it is expected, as a result of the installation of an extensive system of communication by radio with the pilots while in flight. Following months of experimenting, radio-beacon stations have been constructed, planes have been equipped with improved receivers, and plans are under way for the installation of apparatus whereby two-way intercourse between the ground and the moving plane will be made possible. The beacon stations transmit what is known as equi-signal calls in dots and dashes by which the pilot can tell if he is on his proper course. A dot-and-dash signal will indicate that the plane is to the left of the course. Swinging over and receiving a dash and a dot, shows that the ship is to the right. The pilot turns a little to the left and when the dots and dashes blend into one dash, he knows that he is follow-

ing the correct path of the airway. Weather reports are transmitted to the pilot by the voice from the ground stations, on sets tuned to a greater wavelength than that used for the directional beacons. An interruption in the radio beacon will serve as a signal to the pilot to tune in on the weather-receiving set and hear the latest word as to a storm or some other change that may necessitate a change of course. The beacon helps guide the pilot to the airport in fogs. This is accomplished by the varying intensity of the beam signals, according to the position of the plane with respect to the proper route. Marker beacons, sending strong signals, are to be installed at the fields.

2245

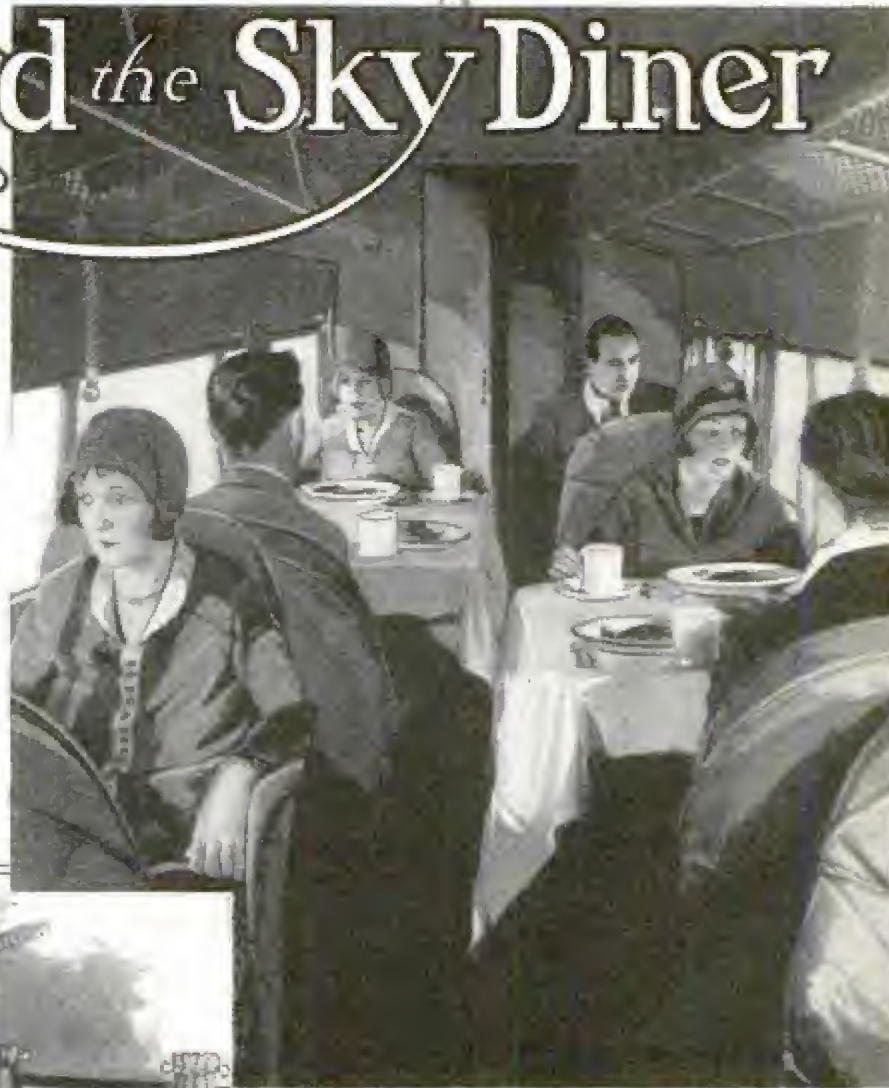


Artist's Drawing of the Sky Diner in Flight, Showing the Cook's Galley, the Electric Refrigerator, and the Interior Arrangement of the Cabin

227 Universal Aviation Corp
105 W. Monroe, Chicago
Mason Peters, Publicity Director

Aboard the Sky Diner

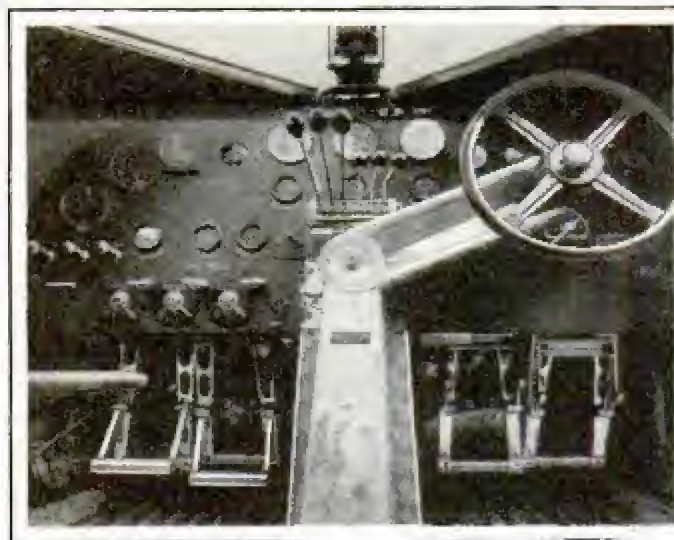
"A BUSINESS man is not investing \$82,000 in an airplane, expecting it to crack up," declared William P. McFail, veteran pilot, who has spent more than 2,000 hours in the sky. He was talking of his latest position as chief pilot for the Universal Air lines on the Twin-City-Chicago route, as he sat at the controls of the new tri-motor Fokker in which hot meals are served to pas-



Dining in the Skies, and Sketch, Showing Method of Adjusting the Tables and the Chair Straps; the Plane Has a Permanent Desk for Writing

sengers—the big "sky diner" that has practically all the conveniences of a Pullman.

"This really isn't flying," he continued, recalling some of his earlier planes. He learned to solo after an hour and forty-five minutes in the air, but he doesn't recommend such speed to the youngster who wants a job as pilot today. "Flying means thrills and more action," he said. "I like to get into a smaller ship, something like that slick Lockheed-Vega over there. It will do 170 miles an hour and a few stunts on the side, but, of course, aviation wasn't planned just for the fun of the pilot. This is the day of sky travel. Why, they're already planning a bigger ship than this. The next step is a four-motored, thirty-two passenger, sixteen-berth sleeping-car plane. The motors will have 2,100 horsepower. You see, the flying idea of the day is for bigger size as well as greater speed. These big planes are just air busses, and the pilot—well, may be you can call him

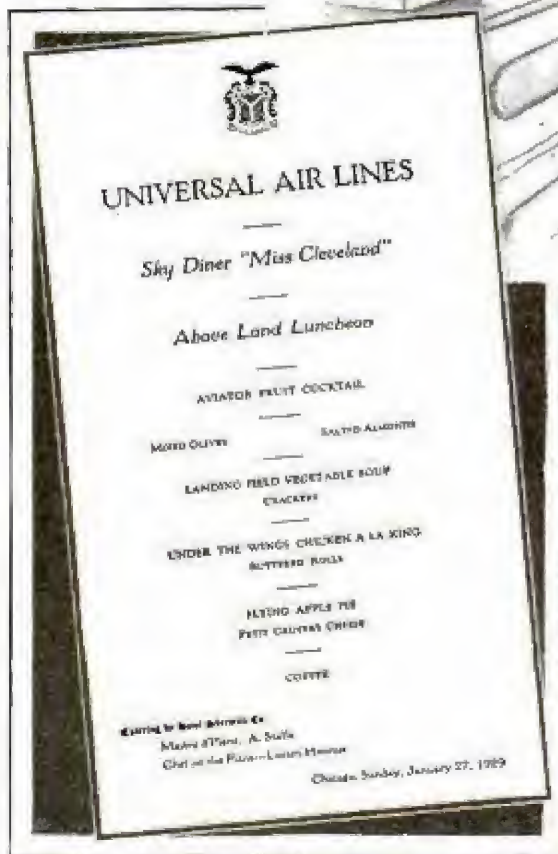


Instrument Board of
the Fokker Tri-Motor
Dining Plane

a cross between a motorman and a bus driver, and, when the flying sleeper comes along, he'll have a dash of Pullman porter."

The armchairs of the latest sky diner are deeply upholstered and there also is a sort of lounge inviting to a nap. At one side of the little door that leads to the pilots' compartment is a handy writing desk, similar to that in a Pullman club car, and on the other side a cabinet for supplies. An ample rack above the seats holds coats and smaller bundles, magazines, ash trays—yes, smoking is permitted in this roomy cabin plane—and other conveniences are generously distributed. Over the pilots' door is an altimeter so that passengers can always see how high they are flying, and a clock in true aviation style, its face showing only the quarter divisions of a twelve-hour day in numerals. Wide, sliding windows afford a clear view of the ground.

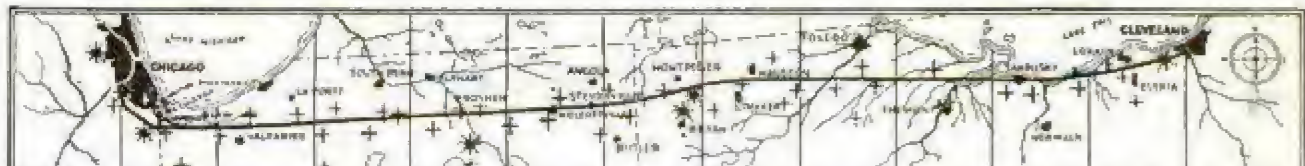
Step to the cook's galley which is just to your right as you enter the plane and back of the well-appointed lavatory. Like



Sketch of the Chef Preparing a Meal, and Menu
Served on "Miss Cleveland's" Initial Trip

all dining-car pantries and kitchens, this is small and compact but completely equipped, ready for serving anything from a five-course dinner to a light luncheon. The chef is blazing a new trail in the culinary arts and already is discovering new problems. For instance, a three-minute egg may not be as hard as a patron may like, but the chef is not to blame and neither is

the water, nor the egg. The sky traveler must remember that the boiling point of water varies every 300 feet of extra altitude or about sixteen degrees to the mile and the sky diner sometimes cruises at an altitude of 5,000 to 10,000 feet. Cooking is done on a small electric stove supplied with current generated by the plane. The dining tables swing out from the side of the cabin and, to the person unfamiliar with the luxury of travel in a cabin air-

												
EAST BOUND	:15	:30	:45	1:00	1:15	1:30	1:45	2:00	2:15	2:30	2:45	SCHEDULE
ACTUAL												
WEST BOUND	2:45	2:30	2:15	2:00	1:45	1:30	1:15	1:00	:45	:30	:15	SCHEDULE
ACTUAL												

plane, are surprisingly steady. The movements, if any, are slow and deliberate, not jerky as in a railroad diner, and there is no need of devices to clamp the dishes to the table as is sometimes necessary in ocean liners. The diner's schedule permits you to leave Minneapolis at noon, arriving in Chicago at half-past three o'clock—plenty of time for luncheon on the wing—or you may leave Cleveland at about seven o'clock in the morning and breakfast among the clouds while your plane soars along in time to land you at Chicago shortly after half-past eight. The three big motors of 400 horse-

power each roar smoothly along, but the noise is scarcely greater than that experienced in a train.

The commercial success of flying lies largely in the tri-motor ship, according to Pilot McFail's estimate of the passenger situation.

"The hazards of the single-motor plane have been reduced to a minimum," he



Time Card Issued Passengers, So That They May Check the Route as They Fly, and Steward Serving

said, "but there is no question about the value of those two extra motors. Instances of a failure of all three are exceedingly rare. If one quits, you can still proceed with the other two. Even if two should stop, you would be in a much better situation than with a dead motor in a single-engined ship, for, with just one going, the tri-motor ship can glide a sufficient distance to enable the pilot to pick a suitable landing field. Of course, you can glide a long way in any good ship without a motor running, but your gliding radius in such a case depends almost entirely on the altitude. With one engine going, the

ship's gliding area is greatly extended. No pilot worries any more about the so-called 'air pockets.' They aren't pockets at all, simply ascending or descending currents of air and their effect on the plane is simply that of a small bump, not so violent as to frighten anyone, and rarely even jars the dishes on the tables.

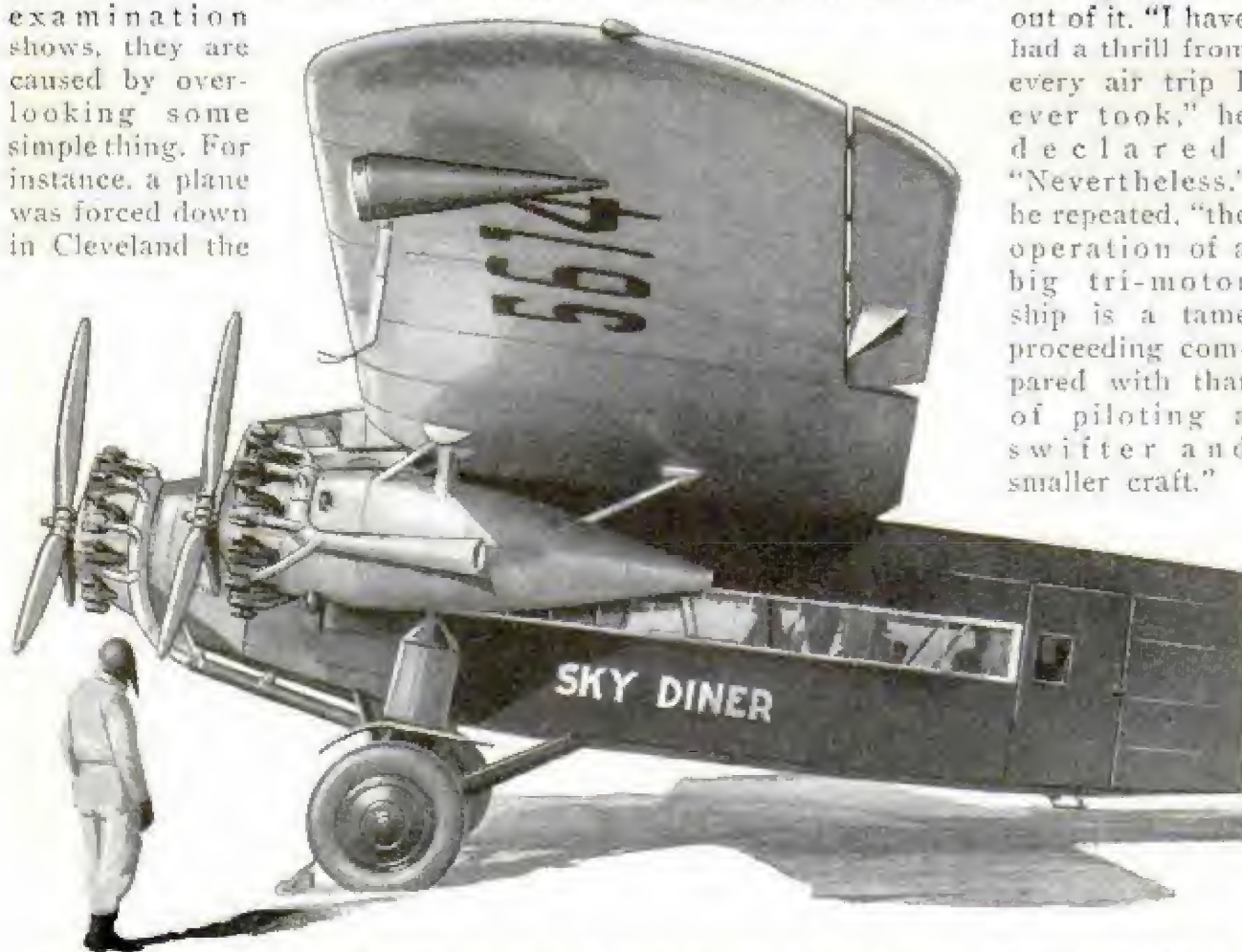
"Some people worry about lightning. But airplanes do not attract lightning. They haven't any ground. And you can run around a thunderstorm or turn back, or even sit down if you have to and fly away again, but forced landings are rare these days. I've flown more than 200,000 miles, I should say, and I've never hurt a passenger or even 'scratched' a ship." He smiled and tapped his knuckles on a convenient piece of wood.

"Flying," he continued, "is a matter of using your noodle. We know that the laws governing the flight of a ship are complex and all that, but, in a way, they are very simple. A ship must fly if it is properly designed and handled. The big passenger planes of the tri-motor type carry relief pilots and there are dual controls. In place of the old-type joystick, there is a control wheel like that of an automobile. This operates the eighty-foot ailerons on the diner and the elevators with practically no effort on the part of the pilot. As I said, instances of forced landings are extremely rare and often examination shows, they are caused by overlooking some simple thing. For instance, a plane was forced down in Cleveland the

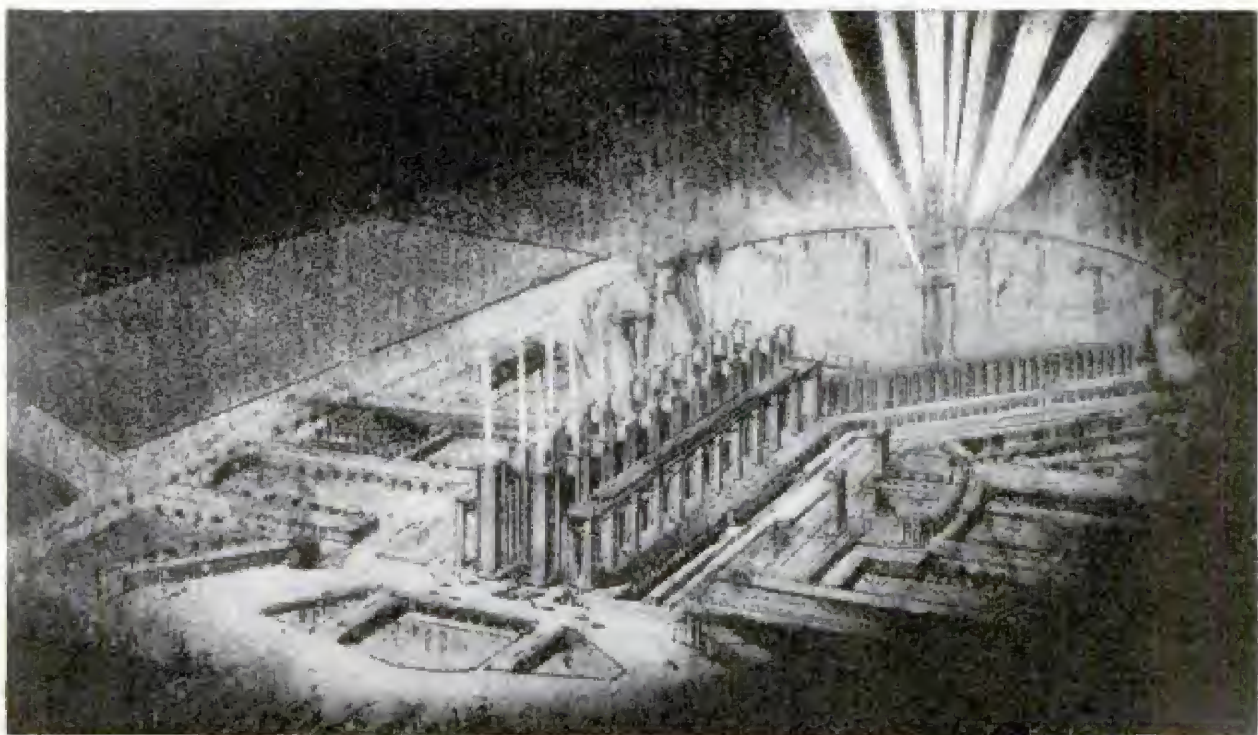
other day—a tri-motor ship. The pilot landed safely with all the passengers and no one was hurt. The ship wasn't even damaged much; but what was the reason for the descent? The motors ran out of gasoline! That is likely to happen to your automobile. There are really just a few hazards left in the whole flying business. Bad weather is the worst of these. Fog is a problem, and when ice starts forming on your wings; well, that is bad, too. But the pilot can turn back when such an emergency arises and that is just what a wise flyer does when possible. The other alternative is a landing. I have had just two forced landings since I started carrying passengers. One was caused by a storm and the other was due to a frozen oil vent."

McFail is typical of the pilot who is being placed in command of the big passenger ships of our air lines. Resourceful, experienced and cool, he nevertheless thoroughly enjoys flying and says that his passengers enjoy their rides all the more when they see that he, too, is getting a "kick"

out of it. "I have had a thrill from every air trip I ever took," he declared. "Nevertheless," he repeated, "the operation of a big tri-motor ship is a tame proceeding compared with that of piloting a swifter and smaller craft."



Three-Bladed Propellers Bore through the Air in Front of the Sky Diner's Powerful Motors; Side View of the Ship with Its Wide Entrance Door and Roomy Cabin



Sketches of Plans Proposed for the Chicago World's Fair in 1933; Some of the Buildings Will Be Constructed on Islands near the Lake Michigan Shore

FIRST PLANS FOR WORLD'S FAIR INCLUDE NOVEL FEATURES

That the Chicago World's Fair, scheduled for 1933, will be vastly different architecturally from the famous exposition of 1893 is apparent from the preliminary sketches which architects have submitted to a commission of the coming fair. Moving sidewalks and a towering column as a dominant feature, are among the ideas

suggested, while a science building of modern design, to be built of steel and hollow tile, is another interesting proposal. Those planning the fair say that unusual effects will be produced with the aid of modern methods of lighting, and extensive use is to be made of glass as a material for building construction.

¶The area of Greenland is about four times that of France.

Putting *the* Run into

St. James Hotel 109 W. 45th New York
By EARL CHAPIN MAY

ABOUT seventy thousand light harness horses are listed in the American trotting register because they have officially trotted a mile in 2.30 or better or have paced a mile in 2.25 or better. Blood lines are not ignored in these "standard-breds." But running horses are thoroughbreds whose ancestry traces back to three Arabian runners brought into England during the seventeenth century.

The breeding and racing of running horses has been the sport of gentlemen since George Washington patronized it long before he became a general and a president. Light harness "trots" and "pacers" are favored by our ruralties be-

repeatedly before going two to five miles to win a race. Runners, "gallopers" or "bang-tails" walk to the barrier and are "away." One short dash decides a running race.



A Flock of Runners Out of a Huge Field of Twenty-Five, Passing the Stands in the Royal Ascot, One of England's Most Famous Races

cause they developed from impromptu races on country roads. Trotters and pacers must be "warmed up" for their track contests. Ten miles of such warming is commonplace. Then they must "score"

The trainer of a light harness horse generally drives his pupil, win or lose. The trainer of a running horse must mount a light jockey on his pupil and depend on the boy for victory. Hence, training a

a Running Horse



runner calls for a technique different from that in training a trotter or pacer. The trainer of a thoroughbred must study his horse and jockey, too. This is essentially a study of character.

While no rules hold in racing horses, a trotter is generally more dependable than a thoroughbred. Given the same track and race conditions, a light harness horse, which goes a mile in 2.02 on Monday afternoon, will go the same mile in the same time the following day. But no man can depend on a thoroughbred. It is too warm-blooded, too temperamental. It can

buck as suddenly and as viciously as a bronco.

The first evidence of the strong "personality" possessed by every thoroughbred is given when the gangling colt is introduced to the halter. Thoroughbreds are hardy animals, born with great strength of body and spirit. Most of those seen on our running tracks are bred in the famous blue-grass region of Kentucky. The lime and phosphorus of that succulent pasturage make small, tough bones and supple muscles, in spite of which young racing weanlings are fragile creatures.

When "Man-o'-War," greatest race horse of this decade, was in the weanling stage, he cut one of his legs on a fence, went lame and was apparently ruined as a "flat" racer. But he was nursed through the difficulty and became a champion. One of the colts of "the golden

stallion" was so much like "Red," as the stable boys always called "Man-o'-War," that it was valued at \$250,000. It gave its owner a mighty scare by shying and kicking itself into lameness. But it, too, got over it.

Because modern racing methods demand speed contests by two-year-olds and a horse does not naturally acquire full development until it is four years old, the thoroughbred speed nurseries in Kentucky have to "force" the youngsters from babyhood. That is one reason the blue-grass region is so popular. With blue



grass as a foundation feed, a two-year-old may stand fifteen hands high in "its stocking feet." But, according to Miss Elizabeth Daingerfield, it costs about \$1,000 to raise a thoroughbred foal to the yearling stage.

Miss Daingerfield, most skillful of all women in rearing thoroughbreds, gains a youngster's confidence by gentleness. She had charge of "Man-o'-War" from infancy and had small difficulty in making "Red" halter-wise. But when, as a yearling, "Man-o'-War" was sold by Maj. August Belmont to Samuel Riddle, and the latter's trainer, Louis Fuestel, slowly and peacefully made him bridle-wise by getting the future record breaker used to a soft leather bit and then to a large-ringed metal snaffle, there was trouble when it came to saddling "Red."

Compared to getting a colt trotter used to bit and reins and to a noisy, clumsy breaking cart, it should be simple to make a colt runner saddle-wise. Without the leaden impost weights, so often called for by the race handicapper, a runner's saddle weighs about three pounds. It is so light and so innocent in appearance that many prospective runners do not resent the

feeling of it on their back. Yet young "Man-o'-War" bucked, reared, screamed and fought the saddle several weeks. By patience and persistence, Louis Fuestel finally had his way. Then "Man-o'-War," like various other thoroughbred champions, became well-mannered on the track. Sometimes he cut capers at the barrier, but he generally saved his energy for racing. His willingness to behave was partly due to the influence of his boon equine companion, "Major Treat."

In the vernacular of the running tracks, "Major Treat" is a "lead pony." Nearly every runner has such a companion from its babyhood. As soon as the colt is halter-broke, it goes round and round the paddock or pasture lot following the lead of its equine pal. The pal is cold-blooded, that is, not entirely thoroughbred. Being of a less nervous temperament, it cools the ardor of the thoroughbred.

When bridle lessons have been



Jockeys Weighing in at Tia Juana; Derby Horses Working Out at Churchill Downs, and an Early Morning "Clocker"



An Upset That Thrilled England: Pat Donoghue, Fifteen-Year-Old Son of the Famous Steve Donoghue, Won the Lincolnshire Handicap Riding a Hundred-to-One Shot

completed, and the colt has ceased to buck and kick at the saddle girth, it is led by the pony to the training track where a light exercise boy of some hundred pounds is given a "leg up" on the candidate for honors at Belmont, Saratoga or Churchill Downs. Racer and pony then temporarily part company.

If the trainer is doubtful about his pupil's nature, he may cling to the "shank" or tie-rope on the halter, which he leaves on the colt's head beneath the bridle. If the pupil bolts, the trainer pulls, so the boy in the saddle need not injure the young racer's mouth. Thoroughbred stock is too valuable to risk rough treatment. At best, this first track try-out is critical.

No one knows whether the youngster will shy at the track rails or at its veteran companions of the track, whether it will run away or behave. The trainer does not have one problem which faces the trainer of a trotting horse, for running is a natural gait, and hence there is no danger of the novice breaking from a trot or pace. But there is always the question of temperament. Many an exercise boy, unseated by unexpected bucking, hits the ground.

A quarter mile is long enough for the

first running lesson. Each day the colt is galloped more and more. Gradually its speed increases until special "clockers" with stop watches begin to take the time of "dashes."

As the yearling enters its second year, the trainer is able to anticipate some of his pupil's possibilities. An apprentice jockey mounts the saddle. An apprentice is a light boy who has won less than forty races, hence his fee is not expensive. If the two-year-old shows promise, a star like Earl Sande or Laverne Fator tries him out some early morning.

Like horses and trainers, the jockeys must be at the track by broad daylight. They diet more carefully than the horses. Laverne Fator's daily program gets him out of bed by 5:00 a. m. and allows him a breakfast of fruit and toast with sugarless black coffee. From six to ten o'clock he is on the track, exercising, schooling or galloping horses of all ages and characters. While the track is harrowed for the afternoon's races, Fator is in bed resting, but, at 1:00 p. m. he reports to the jockey room. On a lunch of orange juice and raw egg, he rides his mounts, perhaps to victory. At 6:00 p. m. he dines, without starchy foods, sugars, milk, cream or pas-

try. At ten o'clock he is back in bed again. One of his jobs, as of any jockey's, is to accustom the colts to the race-track barrier. This is a rubber webbing stretched across the track at the starting line. The horses stand quietly or "act up" back of it, until it is snapped and they are away.

A quick getaway is mighty important to a "bang-tail" dasher. Many races are won or lost at the barrier. It is the jockey's job, with assistance from the trainer and others, to keep his mount's nose pointed in the right direction while he keeps an eye out for competitors. Some racers are "post actors," that is, they cut up abominably at the barrier. But many runners stand quiet though "on their toes." Such a one was "Billy Kelly."

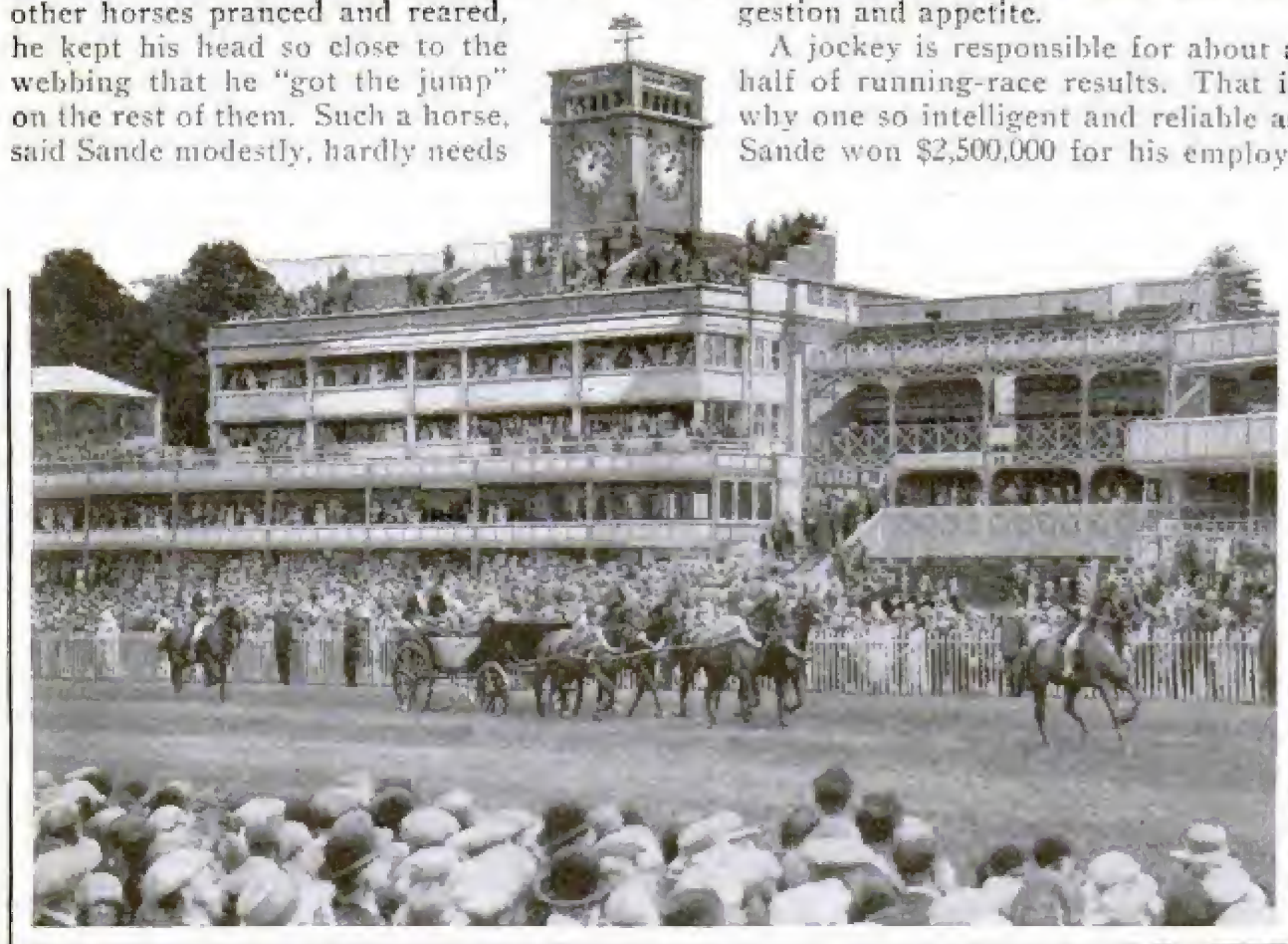
When Sande rode "Billy Kelly" for Comm. J. L. K. Ross, the fast horse was so barrier-wise the grandstand often commented on "the sleepy one." But from the time the jockeys were called out and the saddles put on, and "Billy" left his lead pony and the paddock for the track, he knew what it was all about. While other horses pranced and reared, he kept his head so close to the webbing that he "got the jump" on the rest of them. Such a horse, said Sande modestly, hardly needs

a mount at all. But others are not so tractable. Even after months of training no one knows just what to expect.

In the meanwhile the trainer must solve the shoeing problem. Runners seldom need to be "balanced" as do trotting horses, yet such breeders and trainers as John E. Madden, whose horses have won thousands of track events, either shoe their own with light plates or have their own farriers on the job. A month is a long time for a shoe to last, even if it is of aluminum, yet sometimes they last longer than the runner's legs.

Tendons are watched particularly. A bowed tendon, resulting from pounding of hoofs on hard tracks, may permanently retire a running horse. That is what retired "Man-o'-War" when "the golden stallion" was beating everything. Hot cloths and water, and much rubbing, may reduce a bowed tendon effectively, but in stubborn cases a stable veterinary may "pin-fire" the swelling with hot irons after deadening its nerves with cocaine. A trainer must watch his horses' feet and legs as carefully as he watches their digestion and appetite.

A jockey is responsible for about a half of running-race results. That is why one so intelligent and reliable as Sande won \$2,500,000 for his employ-



The Sport of Kings Is More Colorful in England, For There Are Kings There to Enjoy It; Here Are the King and Queen Riding down the Course Before the Royal Ascot Is Run



"Whiskery," after Winning the Kentucky Derby, Took the Twin City Handicap at Belmont Park; Here Harry Payne Whitney's Famous Horse Is Shown Leading the Field in the Stretch

ers in eleven years and, when retired by increasing weight, was able to start a training stable of his own. A trainer makes and picks his runners, but the jockey has to boot them home.

Producing winners is the trainer's job. Max Hirsh, who trained such sensations as "Sarazen," "Gray Lag" and "Flying Cloud," admits that it is a mystery why a horse that wins easily one day in 1.39 will be beaten on the same track and under the same conditions the next day in 1.39½. Yet under his management, "Sarazen," for whom Mrs. W. K. Vanderbilt paid \$35,000 on Hirsh's advice, won more than \$215,000. Mr. Hirsh, who is one of the leaders among the younger generation of "bang-tail" trainers, says: "In picking a yearling, I must see something in his walk and appearance that appeals to me. But he should have a good eye in an intelligent head, well set on, with a wide jowl to a good neck; a deep, rather than a broad, chest to give him plenty of heart room; deep girth, well-sprung ribs, short forelegs from knees to fetlocks; wide hips; straight hindlegs, not too fleshy; full lower quarters and good flat bone, and he must not be so closely coupled that free action is difficult." To which he might have added a hundred other things. Among things to avoid are eccentricities.

Good horses turn out to be "rogues" that raise Ned at the barrier and bolt

when they should hold steady or be smoothly galloping. Among the banes of the trainer's life is the "morning glory." One such made history on a western track. This horse went like the wind in morning try-outs. A "rail-bird" spotted and "clocked" the wonder. A moneyed owner was tipped off to it and bought the "world beater" at a fancy price. But when the afternoon race came off the wonder didn't win. That horse was a whiz during rehearsal hours but a dud in racing. He was incurably a "morning glory."

2579 GROW CLAMS BY NEW PLAN TO AID BUTTON INDUSTRY

Constant and better supplies of fresh-water clams, whose shells are used in the manufacture of buttons and various novelties, are visioned as the result of an improved propagating and restocking program to be undertaken by the government in streams of the Mississippi valley. Dr. M. M. Ellis, of the University of Missouri, has developed a nutritive fluid which can be deposited in the river beds and is said to remove much of the uncertainty of the early life of the young clams. The first two weeks of their lives are the most difficult, for they are left to shift for themselves, and only a few can find the right kind of food to insure their growth during the first twelve or twenty days.

Chicago Daily News
3/25/10

904
24 9.5
Cmtr. James D. Adair
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POPULAR MECHANICS
Atlanta, Ga

Frank Es Morehouse Radio Corp. of America
263 Broadway
to 5,000 feet, although there was a slight ground mist. The distinguishing distance of this type of red flare was about five miles. It has been recommended that these longer-burning flares be substituted for those now in use which burn only about ten minutes.



Learning the Tricks of Navigation on Dry Land; Naval R. O. T. C. Men at Georgia School of Technology Taking a Lesson

DRY-LAND SAILING TEACHES CADETS NAVIGATION

Members of the naval R. O. T. C. unit at the Georgia School of Technology are taught some of the principles of navigation on a moving ship's bridge, set up on the grounds. It is equipped with a wheel and instruments, and when the wheel is turned, the bridge is guided on a circular track, moving in much the same manner as a real vessel would. With this apparatus, the cadet can learn to steer a prescribed course almost as accurately as he could on board ship.

LONGER-BURNING FLARES AID AIR PILOTS IN LANDING

Flares that will burn for twenty minutes and produce a bright glow have been introduced to fill the need of better emergency illumination on intermediate landing fields and to warn and flag aviators. One of the red flares was seen from a distance of ten miles and an altitude of 1,000

PROCESS ENABLES RADIO PICTURES IN COLORS

Rapid color printing of pictures transmitted by radio has been accomplished by an eastern inventor. He employs a heat-sensitive, wax-coated paper, over which a hot-air brush is passed, the jets being actuated by radio impulses. The hot air melts away the wax making a pattern that corresponds to that on the original photograph

being sent. An ink roller is run over the wax surface, bringing out the picture almost instantly and in permanent form. By means of a code, the receiving operator is able to ink the picture in colors.

THREE-WHEELED AUTO TRUCKS REDUCE CONGESTION

Three-wheel automobile trucks have appeared in London and are used with success in the crowded parts of the city, according to reports. They can be turned around in their own length, are easily steered, and have large carrying capacity.



Easily Steered among Congested Traffic. This Three-Wheel Auto Truck Is Proving Useful in London

*Hall, Lawrence &
Ratcliffe 1123 U*

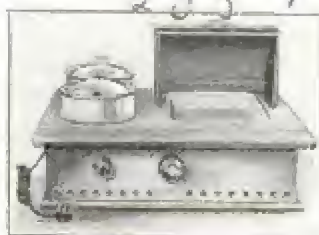
Madison Chicago

"TELEGRAPH-POLE" PLAN JAIL TO REDUCE CRIME

Interesting features abound in Cook county's new criminal courthouse and jail at Chicago, recently completed at a cost of approximately \$7,500,000. Having, in round numbers, 1,400 cells, the jail occupies part of the rear portion of an eleven and one-half acre plot and has been constructed on the so-called "telegraph-pole" plan, that is, with various units extending on either side of a central two-story corridor, representing the pole. Each cell is five by eight feet in size, and all have drinking fountains. Included in the typical cell block, or group of cells, is a large day room, for the prisoners. At the entrance to each block from the main corridor, is the guard's room, from which all the cell doors are locked or unlocked, separately or together, by mechanical controls operated by systems of levers. Visitors are allowed to speak to inmates but may not come directly in contact with them, thus preventing any attempt to pass in weapons or drugs. This is accomplished by means of booths with windows of shatter-proof glass. The prisoner stands on one side, the visitor on the other, and conversation is easily carried on, as the sound of the voice is carried through openings in the corrugated metal partition between the glass window and the frame, but these openings are so arranged that no article of any kind can be passed through.

ELECTRIC WARMER FOR FOOD REQUIRES NO WATER

Food is kept warm by electric radiation and hot air in a "steam" table recently introduced. No water is required. Current is supplied from a house-lighting socket and no special wiring is necessary.



*All Rite Co.
1111 N. Dearborn St.*



Lowering Aviator Safely to the Ground After His Plane Had Been Wrecked in a Tree Top

AVIATOR RESCUED FROM TREE AFTER PLANE IS WRECKED

2184 Thomas Halton.
A tree saved the life but wrecked the plane piloted by a Pennsylvania aviator recently. At an altitude of 2,500 feet, the ship went into a tailspin and could not be brought into full control before it crashed into the tree. The pilot, who suffered only slight injuries, was rescued with ladders and ropes.

Scranton Pa.

¶ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

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906

POPULAR MECHANICS

2575
School for the deaf
Hartford and Electro-
Mech.



Classroom Installation of the Radio Apparatus for Instructing Pupils Who Are Hard of Hearing

ELECTRIC SET TO TEACH DEAF RUNS FROM LIGHT SOCKET

Use of sound amplification to teach deaf children and other persons of deficient hearing was highly stimulated by the birth of radio, since amplifying equipment of much greater effectiveness than any known before became available and sound could be controlled. Radio apparatus for instruction of the deaf has been improved along with other wireless units. One of the latest installations, adapted especially for teaching children in a classroom, is so connected that several pupils can listen at one time from their seats. Music or voice is picked up electrically from a record in the main cabinet, which uses no batteries but operates from a lighting socket. This permits even service at all times, which is an important feature.

BEST MARKS FOR AIRWAYS SHOWN BY COMMITTEE

Adequate markings for the guidance of aviators in every city, town and hamlet are urged by the department of commerce. A report declares that legends should be as simple as possible, that chrome-yellow characters on a dead black background are preferable, and that the height of the letters should be from ten

to thirty feet. In no case should the letters be less than six feet. The spacing between the characters should be not less than one-fourth the height of the letters. Careful specifications for the illumination of airway signs and guides also were worked out.

RAILROAD TRACTOR IS MOTORED BY AUTO ENGINE

A five-ton railroad tractor, for use in moving cars in factory yards and similar industrial switching, is being marketed in France with a Ford engine for motive power.

Power is transmitted to both axles by a single chain drive, so all four wheels are drivers, and the necessary weight to give traction is obtained by casting the entire chassis, thirteen feet long, in one piece. The machine has three speeds in either direction, each controlled by a separate clutch, so that all gears remain constantly in mesh, including those of the reversing mechanism. The normal hauling speeds are two, four and one-eighth and six and one-fourth miles an hour, and from a standing start, the machine can move 120 tons on level tracks. Some idea of the difference in American and European machinery prices is gained from the fact that the machine complete sells at \$1,400.

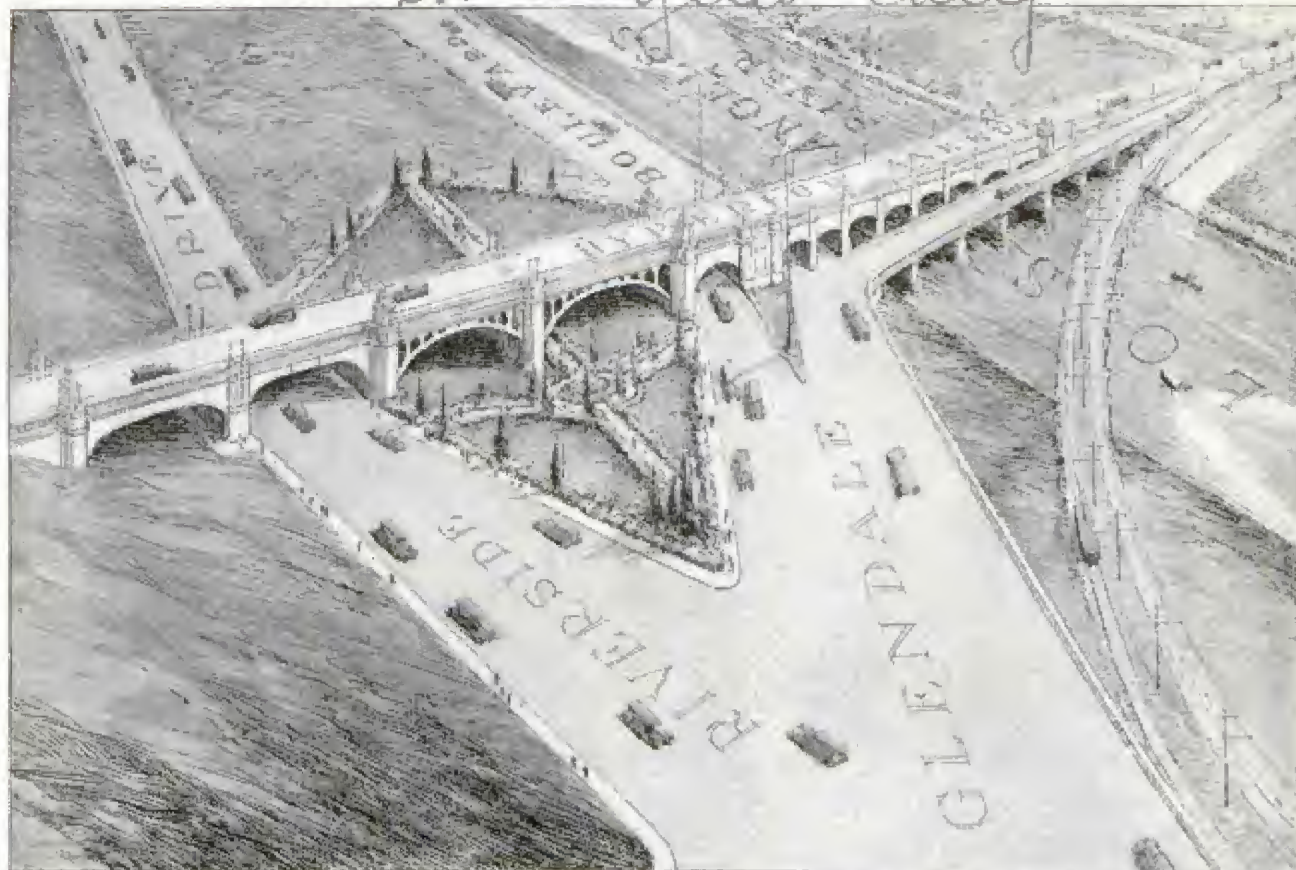


Railroad Tractor, Powered with Converted Ford Engine, for Use in Moving Cars in French Yards

2539
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Caston Movies

2917 Mt. View
1512 1/2 Rosalia Road
Los Angeles Calif



Drawing of Unusual Viaduct That Spans a River and Two Boulevards and Enables Easy Passage to Different Levels; It Solved a Difficult Traffic Problem near Los Angeles

ODD TWO-LEVEL AUTO BRIDGE RELIEVES CONGESTION

Several unusual features are combined in a highway bridge near Los Angeles. It spans the Los Angeles river and, at this point, is really three bridges in one, in order to accommodate traffic to and from

the city and on one of the main boulevards it serves. There are thirteen spans in all, of varying height and length; the bridge proper is 1,600 feet long, and the project cost more than \$1,000,000. By skillful engineering, automobile and electric-railway traffic was going on uninterrupted during the construction.

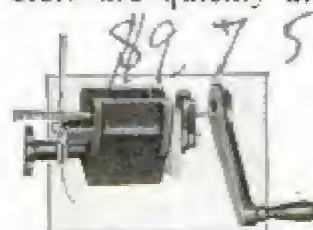
FLYING HOTEL TO CARRY EIGHTY AND HAVE TWELVE MOTORS

Twelve-motor flying boats, capable of carrying eighty passengers at 200 miles an hour, are being planned by Dr. Claude Dornier, the German designer. The huge ships will virtually be hotels of the air, offering restaurants, reading rooms, promenades and other features associated with land structures. The boats, of which three are being planned, will have a wing spread of 150 feet; the twelve motors will develop 6,000 horsepower; each ship will weigh fifty tons loaded and can cruise 2,700 miles. They will be able to land or take off in a heavy sea and are to be of the monoplane type. The craft will be used to carry mail from Europe to South America and for passenger traffic about Europe. Doctor

Dornier believes that planes carrying as many as 250 persons are a probability of the next few years.

RAPID COIL-SPRING WINDER MAKES MANY SIZES

Coil springs of many lengths and diameters are quickly and easily prepared on a simple winding machine which has been placed on the market recently. Duplicate springs can be made with great accuracy, it is asserted, and care rather than skill is required to operate the winder so as to produce uniform coils.



Herald Examiner
2/22/24

The Shaler Co.
West Park Place

Wild Life is Preserved in Glass Cages



A. G. Rueckert, Staff Taxidermist of the Field Museum of Natural History, Preparing a Model Bear Group

thrills and adventure as well as hardship and difficulty.

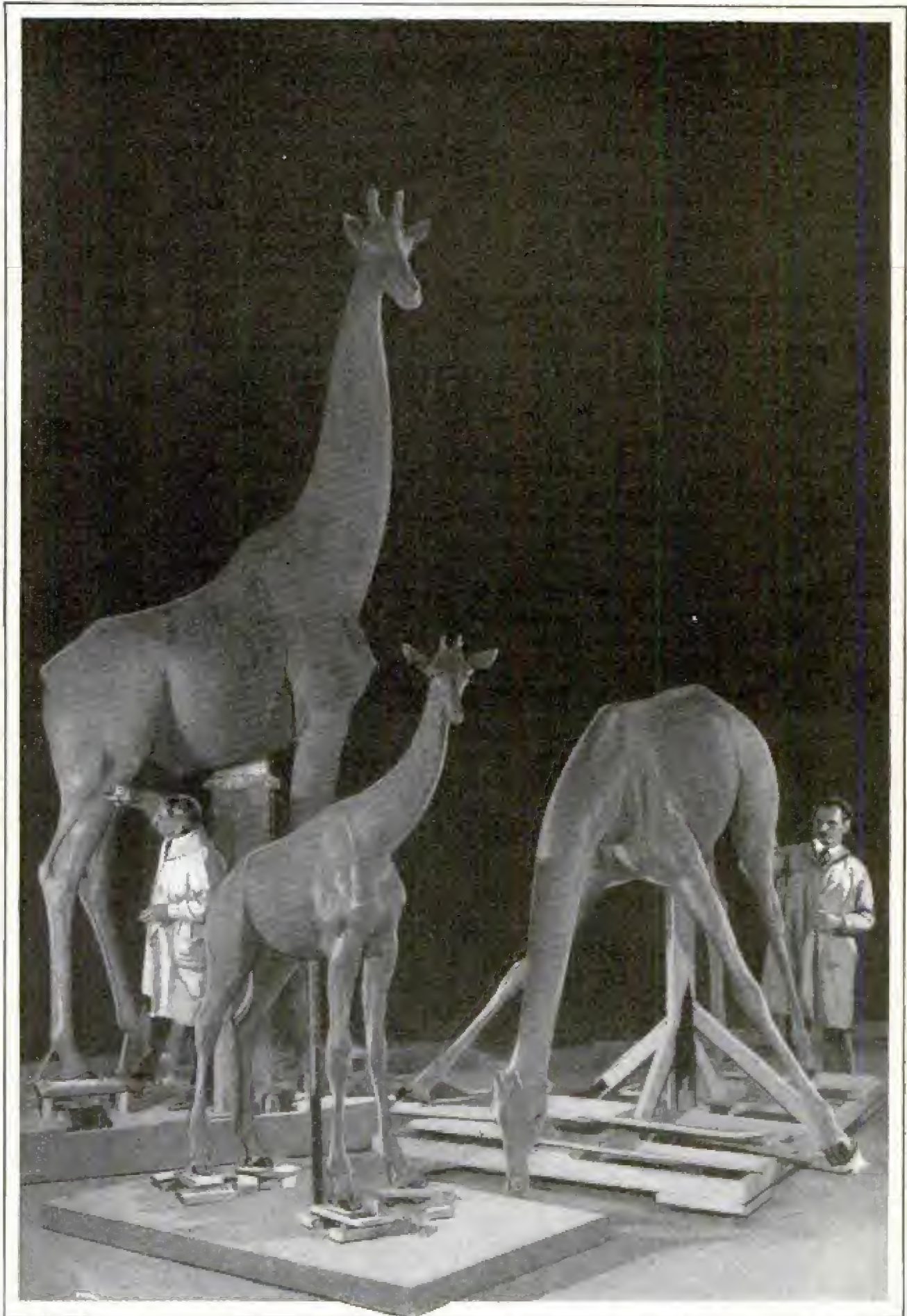
When the late Carl Akeley prepared the ponderous body of "Jumbo," beloved circus elephant killed in a railroad wreck, and the first large African elephant to be mounted in this country, and when Dr. William T. Hornaday, a few years before, finished his orang-utan group, one of the first of its kind in America, they laid the foundation for present-day methods in taxidermy. They, and a few others who followed in their footsteps, are largely responsible for the effectiveness and educational value of

THE wildest-looking wild animals to be seen in civilization today are not in the zoos or circuses, but in the big glass cases of the modern museum. Of course, they are dead—and hollow too—but they seem alive in all their natural beauty because skilled sculptors and other craftsmen have literally taken the stuffing out of taxidermy. The days of stuffed animals are practically gone. The craft, by the way, is one of the most recent of all the arts, probably not much more than 300 years old, and in late years, improved tools, better methods and higher standards have given the profession a wholly new tone. Today, a true taxidermist is a sculptor-painter-naturalist, and his work is full of

the modern museum groups which literally bring the animal life of jungles, deserts and the frozen seas to the doors of the cities.

Many steps are involved in the creation of a big-animal tableau and a complete description of them all would require a book. In the studios of the Field Museum of Natural History, some of the most important steps in this highly interesting work may be observed.

Over there in one corner, A. G. Rueckert, one of the staff taxidermists, and a member of the recent Rawson-Macmillan-Field museum expedition to Labrador, is preparing the working plans for a large bear group. From photographs, silhou-



Courtesy American Museum of Natural History

At Work on Giraffe Specimens for the Water-Hole Group in the American Museum of Natural History; These Three Fine Specimens Were Obtained in Africa by an Expedition Headed by the Late Carl Akeley

ettes cut in paper and from other data, he is preparing a small model on the scale of an inch and a half to the foot. The tiny animal figures are carefully molded and arranged as they are to appear in the finished display and a painted background is added so that this first model is literally a miniature of the final booth.

J. Friesser and his assistants are at work on the big figures. They are using some of the actual bones from the animal specimens to form a foundation, and a clay model is built up after the pattern of the small wax figures. From the clay, a plaster-of-paris mold is made and from this cast the final body of the animal is obtained. This—the "manikin"—is built up from plaster and reinforcing materials and is the structure over which the animal's original skin, which has been carefully tanned and treated, is stretched. The base is anatomically correct in every detail, a fact that largely explains the lifelike appearance of the finished animals. Charles A. Corwin, museum artist, who accompanies some of the expeditions that he may obtain his material directly from nature, has painted the large scenic background for

installation inside the case. Building the cabinet itself is a special task, as it must be as nearly airtight as possible to keep out dust, and the lighting arrangements are adjusted with great care in order that the group may be displayed to the best advantage. After the entire assembly has been approved by Dr. Wilfred H. Osgood, curator of zoology, and by other naturalists of the museum staff, it is ready for public exhibition.

The more exciting episodes in the work, of course, occur on the hunts, and some of the taxidermists' most important work is done out in the wilderness, far from the museum's studios. For instance, careful measurements and death masks are made of some of the animals' heads and other parts a few moments after the specimens have been killed, and the larger bones are removed for the model foundations. All this requires skill and expert knowledge of the animals and their anatomy. Only the most perfect individuals are selected for the museum displays. The choice requires familiarity with the best kinds of hides and skins, knowledge of the species being selected, and care must be taken not



J. Friesser Building Up the Plaster Cast of a Bear from a Clay Model; the Finished "Manikin" Is the Base over Which the Skin Is Stretched; No Stuffing Is Employed in the Figure

to mutilate the animal in the killing or in the skinning.

The successful taxidermist-naturalist must be a man of resource, endurance and bravery. Up in Labrador and Baffin island, for instance, members of the Rawson-Macmillan-Field museum expedition met severe hardships and perils along with the joys of the trip. They found treacherous ice fields that gave way under the dog teams and human travelers, severe winds hampered their progress and they were forced to wage constant warfare against the two most desperate foes of the northern traveler, the mosquito and the black fly. These pests bite with great ferocity at all times of the day and far into the night. After a day of travel, it is not uncommon to find one's underclothing stained with blood from their savage thrusts. Hands and wrists must be bandaged and the face protected as thoroughly as possible. Were it not for these enemies, Labrador would be an ideal summer resort in many ways, the travelers declare, for it abounds with beautiful scenery, the waters teem with fish, and there are countless wild flowers of gorgeous colors even far above the timber line. Most of the trees, where trees grow at all, are dwarflike, some not exceeding a few inches in height.

Some of the members of the expedition helped build a ten-room house as a base of operations at Anatalok bay. At another time, a member of the party had an opportunity to show his resourcefulness. He had collected a number of valuable birds' eggs, some of them worth more than \$10 apiece, but discovered that the blowing outfit had been left at camp sixty-five miles away. With part of a condensed milk can and some bits of adhesive tape, he devised a successful blowpipe and brought the precious eggs safely back along with some 6,000 other specimens the expedition had collected.



Big Lifeboat Being Tested off English Coast; It Holds 150 Persons and Has Eight Water-Tight Compartments

LIFEBOAT THAT WON'T SINK HOLDS MANY PERSONS

Fitted with eight water-tight compartments, a non-sinkable lifeboat introduced in England, will hold 150 persons. The craft has performed satisfactorily in tests.

SWEEP WIPER FOR WINDSHIELD CLEARS ENTIRE TOP

Clearing a wider area, an improved type of windshield wiper operates with a sweeping action and cleans nearly the entire top of the glass. This is said to cause less interference with the vision.



Wide Windshield Wiper Which Sweeps across the Top of the Glass, Clearing a Larger Space

"LIVING LIGHT" A POSSIBILITY SCIENTIST DECLARES

Will man be able to duplicate the firefly's light? In the opinion of Dr. E. Newton Harvey, of Princeton, some form of "living light" may be produced in the scientist's laboratory through the application of known principles. He asserts that it is possible to devise a lamp in which "luciferin" is burned continuously over and over again. The resulting light is weak but the principle is there and may be applied in the future development of a new means of illumination, he says. The firefly is highly economical in that it burns an oil and then re-forms the substance so that it can be burned again. Doctor Harvey found that this light, and that from other organisms which produce luminescence, is an oxidation and requires oxygen and water. Some animal matter, he discovered, became luminous again after moistening. If oxygen is removed from a luminous animal, its light disappears completely, but returns when the oxygen is readmitted.

ANTI-GLARE SHIELD ON HAT FOR AUTO DRIVER

Easily attached to the brim of the hat, an adjustable shade is intended to shield the wearer's eyes from the glare of automobile headlights. It does not interfere with the vision, and may quickly be raised out of the way when not needed.



Shield Adjusted to Hat Rim, to Protect the Eyes from the Glare of the Sun and of Auto Headlights



Gasoline-Price Gauge at Filling Station, with Adjustable Arrow for Quoting the Latest Figure

PRICE GAUGE FOR GASOLINE AIDS FILLING STATION

Motorists are clearly informed as to the current prices of gasoline at a California filling station by means of a huge arrow gauge which can easily be adjusted to point to the proper figure. The device was especially helpful in attracting customers during a recent price war when the cost of gasoline changed almost daily.

GRINDER RUN AT HIGH SPEED - SHARPENS DIES

For sharpening threading dies, a grinding wheel, run by a high-speed motor, has been introduced. It turns at more than 400 revolutions per second, the fast rate being attained by the special motor and frequency changer, which converts 60-cycle current into 420 cycles. The oiling system for the motor is automatic so that it requires little attention.

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2554

newspaper Times Herald

2506

London

Chrl.

2 Garbes + Myers. 172

Union St. 1811 or motor mass

2438 *Cont. Clay St. & Rager*
151 21/2 Rosalia Road
 POPULAR MECHANICS *Los Angeles, Calif* 913



Tide Rips and Undertow, Which Often Prove Dangerous, Are Eliminated at a New California Beach, Which Has a Long Semicircular Sea Wall to Insure Still Water in the Pool

FORTY-ACRE SWIMMING POOL REDUCES HAZARDS

Swimming in still sea water will be enjoyed in a forty-acre pool now being constructed close to shore at Long Beach, Calif. Breakwaters will shield the swimmers from surf and tides that sometimes prove dangerous. The pier is in the form of a horseshoe and, at the open end, is to be an eight-acre plot which will provide space for a large auditorium, theater, and convention and athletic halls. There will be a roadway for vehicles on top of the breakwater, which is 3,800 feet long. On the inner rim will be a gallery with large seating capacity for those who wish to watch the bathers. The project is to cost \$5,000,000 and is scheduled for completion some time in 1930.

ARTISTS IN BUTTERFLY WINGS DO THEIR WORK BACKWARD

Artists who develop designs from butterfly wings at a London studio, work with great care not to destroy the fragile material and spoil the coloring, and build up the patterns backward in order that they may appear in the proper arrangement on the vases and other articles they decorate. As many as fifty wings are used for a sin-

gle picture, the outline of which is first traced and a small portion sketched in with paints. The greater area of the design is developed with the wings, which cannot be surpassed for their natural coloring and blending. Small shears and tweezers are used in preparing the wing fragments. The pieces are never touched with the hands as that would disturb the colored dust. Many of the wings are shipped from the swamps of central South America, where natives collect them after the insects have died.

THREE-SURFACE SANDING BLOCK FITS HAND AND WORK



"Ease of operation and efficiency are features claimed for a sandpaper block that comfortably fits the hand, takes a half sheet of standard-size paper and has three sanding surfaces. One is for grooves, the

other for curves and the third for flat surfaces. The paper is held in place by adjustable clips.

Answers 8/16/29

in Clerkenwell London, Eng

Paul E. Wyke 629 S Spring St

Los Angeles, Calif



Courtesy The Sphere

The Color of Old China; a Buddhist Monk Praying before the Principal Altar in the Temple of Ten Thousand Generations, near Peking; in a Wing of This Temple Tsi-Hsi, the Last Empress of China, Established a Library Where She Spent Many Hours in Study

TONGS

Young China in America: Boys in San Francisco's Chinatown Getting New-Year's Good Fortunes from the Mouth of the Great Dragon That Means Peace and Joy for All Who Behold It; Some Processional Dragons Are Hundreds of Feet in Length



"**T**ONG War Breaks Out Again," headline the newspapers about once every year or two, with details of the killing of one or more Chinese in some American city or cities, and the added information that police in San Francisco, Chicago, New York and other centers of Chinese colonies are on the watch to avert further violence.

Coupled with these news stories, the reader usually finds the names of two organizations—the On Leong tong and Hip Sing tong—and the average reader concludes a Chinese tong is some sort of gangsters' organization. Nothing could be farther from the fact.

For example, there is Ming Gai Hong, otherwise known as the Four Brothers' tong. If Ming Gai Hong is a gang, then the D. A. R. and the Pilgrim's society are

gangs, for virtually the only difference between the Four Brothers' society—which is what the word "tong" means—and the Sons or Daughters of the American Revolution is that the Ming society is quite ancient, being a few years older than Christianity itself.

Why does a tong war almost invariably involve On Leong and Hip Sing? If the newspapers announced that, as a result of labor difficulties between the Chinese merchants' and employers' association and the union of Chinese restaurant and laundry workers, one or more Chinese on one or both sides had been killed during strike riots, the story of a tong war would cease to be a mystery.

Hip Sing is the Chinese version of a labor union, and On Leong, the Chinese merchants' association, is a chamber of



Lina Leong, Queen at the Opening of a Chinese Hospital in San Francisco, and, Below, Tsewje, the Lion, Chasing Evil Spirits Away during the New-Year's Festivities in February

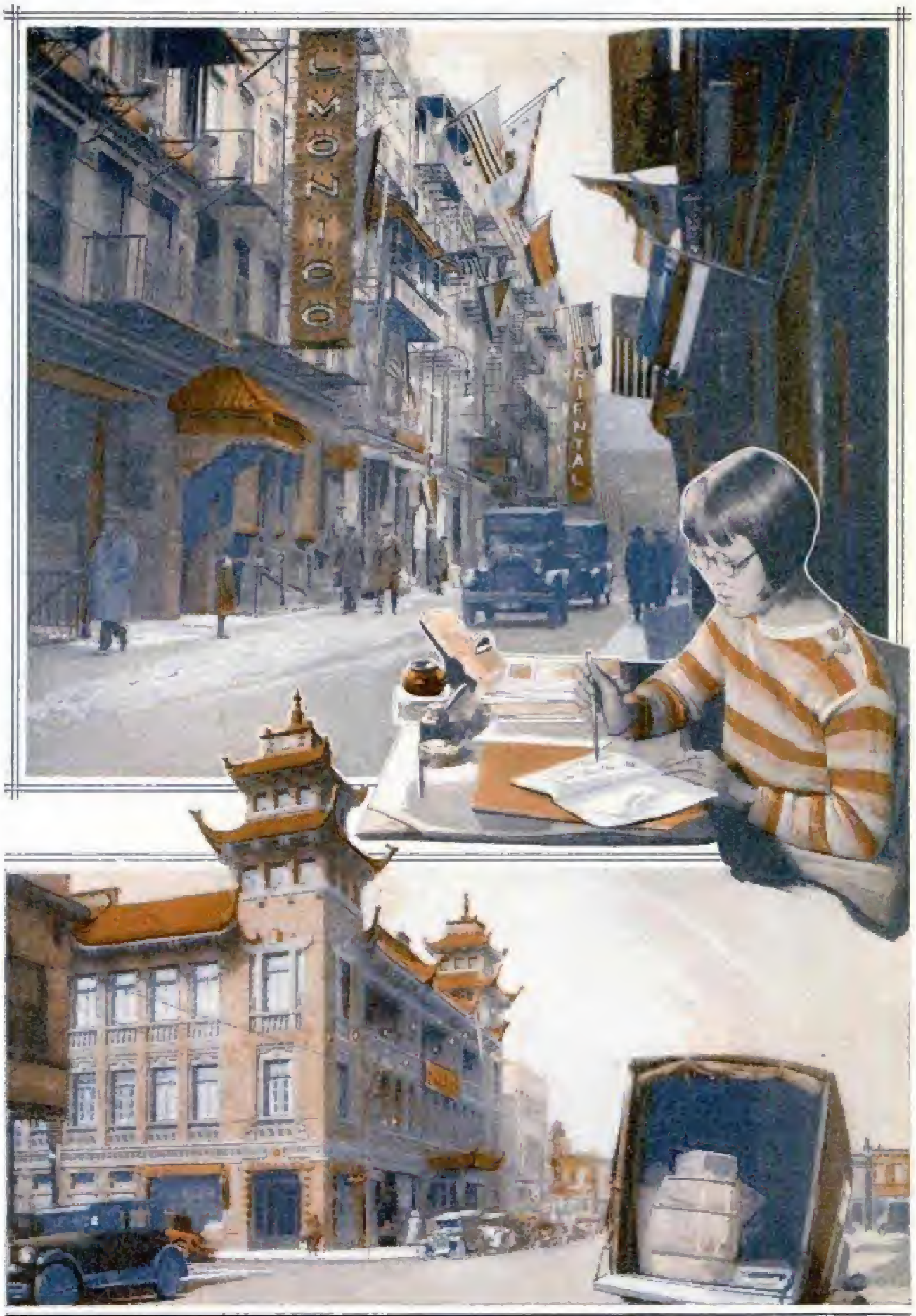
commerce, church, fraternal society, city council, judge and jury and public school, all rolled in one.

Both of them are comparatively young, as Chinese societies go, and both were organized in America. On Leong is slightly over forty years old, and Hip Sing less than that. Compared with Hoy On and the Ming Gai Hong tongs with their history of more than 2,000 years, both are newcomers.

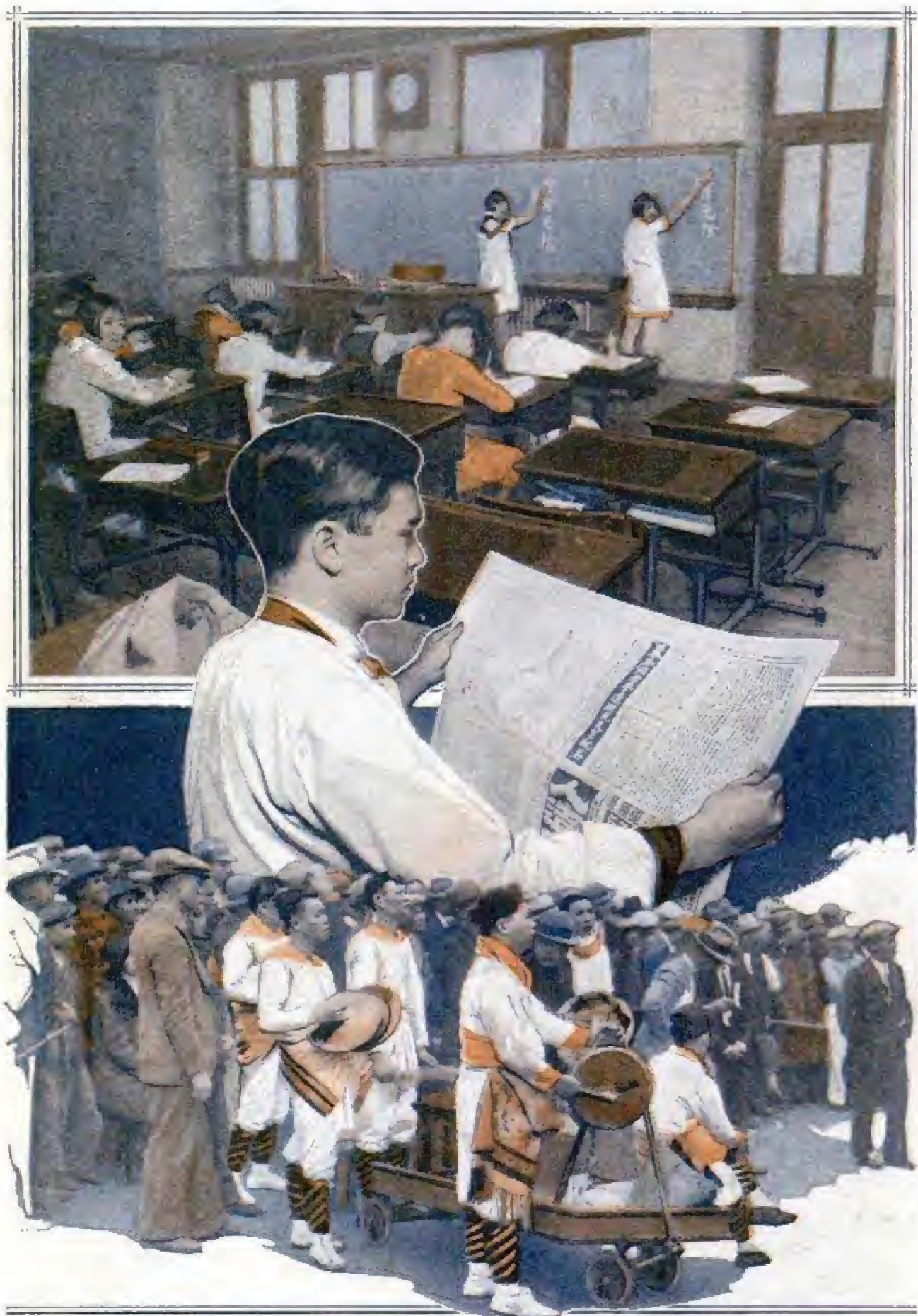
On Leong, however, has become the

most important tong in the United States because its local chapters include practically all of the more well-to-do merchants. In San Francisco, Chicago and New York elaborate tong houses have been built, blending Chinese and American architecture in a striking new composite.

From the time of the first white invasion of the Chinese seaports down to within the last two years, every foreign nation, in its treaties with the Chinese, insisted on the right of extra-territoriality for the



Pell and Mott Streets, the Heart of New York Chinatown, and, Below, the On-Leong Headquarters in Chicago; the Inset Shows One of the Teachers in the On-Leong Chinese School



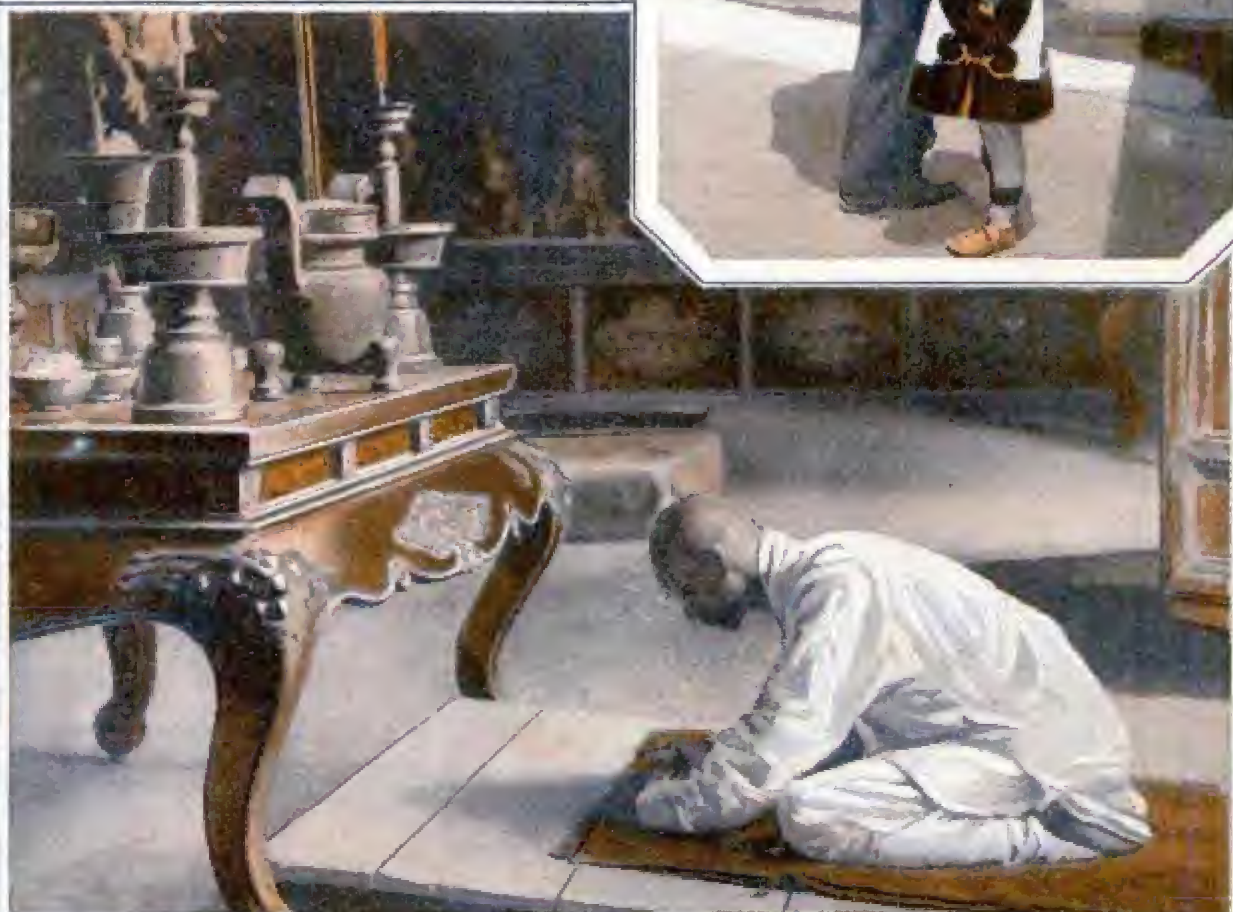
Learning Chinese Character Reading and Writing amid American School Surroundings; a Proofreader on a Chinese Newspaper, and the Band That Helps Tsewje Chase Evil Spirits Away

foreigners, including trial only in white courts. Without any treaty protection, the Chinese in America have gone much farther than that and set up their own government through the tongs. Every big Chinese center has its Chinese mayor, courts, judges, juries and schools. There they settle all disputes between themselves, the society as a whole being banded together to enforce its decisions.

Chinese are practically unknown in the American law courts—one civil case only, and that one a divorce suit, has been filed in Chicago, with its 10,000 Chinese population, in recent years. Aside from arrests during the tong wars, and an occasional arrest for violation of the narcotic laws, criminal cases involving Chinese are almost nonexistent.

The organization of the new On-Leong tong house in Chicago, opened last summer with firecrackers, dragons and a typical Chinese celebration, is representative of the bigger societies. In a very modern American-style council chamber and

courtroom, the directors of the society regulate the activities of its 2,000 Chicago members, hear their disputes, and in a near-by room, under a Chinese inscription reading "Comfort for all Law-Abiding Citizens," the juries reach their verdicts.



Bottom, Courtesy The Sphere

The Contrast of Old and New; a Chinese-American Reading Bulletins on a San Francisco Wall, and a Priest Praying in the Temple of Ten Thousand Generations near Peking



The Chinese High School in San Francisco, Where Night Classes in the Classics Are Held to Keep the Public Day School from Completely Americanizing the Children



Mary Chu, Queen of the Feast of Lanterns, One of the Festivities of the Chinese New Year in San Francisco, and, Below, a Two-String-Fiddle Player in the Chinese Theater Orchestra



Lee Toi, President of On Leong in Chicago, and Frank Moy, "Mayor" of Chinatown, at the Altar of Kwan Tai, and, Below, Moy Placing a Food Offering on the Altar

The main chamber, however, is the temple of Kwan Tai (pronounced "Toy"), warlord of the Hun (pronounced "Hahn") dynasty, who flourished 2,000 years ago. There, before a great gilded altar, incense burns day and night, and offerings of fruits, rice and other foods stand amid bright-red prayer papers, printed in Chinese characters on long, narrow strips.

Around the room rows of marvelously carved teakwood chairs provide seats for the elder dignitaries of the society. The back of each chair is inlaid with an oval of marble, each piece selected because the graining of the stone, in black, brown and gray, resembles a Chinese landscape. On special occasions, such as the Chinese New Year's celebration, which comes in February, the backs are hidden under beautifully embroidered covers, in bright reds, greens, pinks and gold thread.



Downstairs, three classrooms house 150 Chinese children each weekday afternoon for two hours. They attend the American school until 3:00 p. m., and at 3:30 are due in the Chinese classrooms to study Chinese character writing and reading and the history of China.

The same Kwan Tai, who is patron saint of On Leong, also is one of the deities of the Four Brothers. The other three were Low (pronounced more like "Lew"), Joung and Chew, and the descendants of their four families are the members of the tong today. The four became famous when, although they were only commoners, they rallied an army to keep one of the last of the Hun emperors on his throne, 2,000 years ago. Kwan Tai was in his thirties when he became the warlord of the dynasty. Both Kwan and Joung were famous fighters, but when Chew, who was only seventeen at the time, joined



Rose Lee, Candidate for New Year's Queen, Demonstrates Her Skill on a Two-Stringed Instrument; Top, Children in San Francisco Chinatown Firing Holiday Firecrackers

them, he soon acquired an even greater reputation, according to the Chinese histories.

In recent years the Ming Gai Hongs have split, in this country, into an original Four Brothers' society and a Younger Four Brothers, the latter including the younger American-born and trained Chinese who became impatient with the conservatism of their elders.

The Americanization of the younger Chinese is rapid. In the schoolrooms of On Leong, while waiting for classes to begin, the youngsters romp around, shouting the latest American slang and singing the latest song made popular by radio. The Chinese school endeavors to keep them versed in Chinese literature and ideals, but as they grow up, they turn to baseball, the movies, and other American innovations, and few of the younger generation are seen in the Chinese theaters.

The Chinese theaters, presenting both the older classics and modern plays, are in a class by themselves. The plays are really operas, for a good part of the show is sung, in a flat, screechy monotone, accompanied by a Chinese orchestra that can produce more weird sounds than all the jazz writers of America ever dreamed of. One, two, three and four-string fiddles, a set of drums and a fair-sized boulder on which the drummer can beat a tattoo—supplement these with a pair of extra-size cymbals, and you have a Chinese orchestra. Wind instruments are not used in the one selection that is played for all songs in the regular opera, but for such special scenes as a wedding or occasional procession, a set of trumpets and Chinese flutes and oboes join in with an ear-splitting din.

On the stage, there is neither scenery nor backdrop, and all the props are piled up in plain view. A stage hand, usually in a blue coat with brass buttons, wanders back and forth, placing the props as they will be needed, and jerking them away as soon as they are used. A good part of the acting is pantomime, and a good Chinese actor needs few props to convey his idea, even to an American audience. Some of it is very funny to American eyes. To see a stage hand place a table in the center of the stage, put a chair at either end, and two more on the table top, and then watch a procession of actors solemnly climb over chairs and tables, to represent a journey over the mountains, while the stage hand stands by to remove the first chair used as the last actor steps off it, is, to say the least, something different.

But that is Chinatown.

CABS COMMANDED BY RADIO TO SPEED SERVICE

251 "Cab No. 7; the passenger you just took to 2857 Market street left an umbrella in your cab. Return with it at once." "No. 11; call at 158 West Main street for three passengers." Messages such as these are

passing through the air at Akron, Ohio, where a fleet of radio-directed taxicabs is in operation. Broadcasting is done on a short-wave set from the central office, and the orders are received on special sets installed near the driver. Headphones were used at first, but these have been abandoned for loud speakers. Tests have shown that the system is practical and saves drivers and customers time, as orders can be transmitted to cabs while en route with or without a fare.



One of the First Radio-Equipped Taxicabs; Headphones Later Were Discarded for Loud Speakers

*Akron Taxi Cab Co
Akron Ohio*

Iron Age 3/1/19 R 810

MIXING NATIONALITIES SPEEDS PRODUCTION, EXPERT FINDS

Mixing men of two nationalities in a working team will result in a greater work output than if one nationality alone is employed, according to Dr. Edwin Hulme McIlvain, director of the employment service of a large Philadelphia industry. The mixed crews worked better also in teams where the numerical strength was unequally divided, as in a five-man gang in which three were of one race and two of another. A study of national characteristics and personal temperament also is necessary, according to Doctor McIlvain, to fit men to the proper jobs.

SORTER FOR NUTS AND BOLTS SAVES FACTORY TIME

Patents have been applied for on a sorting machine to separate bolts and nuts of different sizes. It is operated by an electric motor and consists chiefly of revolving master screws that take the contents of a hopper and spread it along over a mesh which has openings in graduated sizes. The smaller units fall through first into the proper bins and the larger ones are carried along until they also slip through the mesh into the compartments arranged for their size. Screws, nuts and bolts are not placed in the hopper at the same time, as special adjustment of the master screw is necessary in handling them.



Sorter That Separates Nuts or Bolts of Different Sizes from Hopper

Inv. H. E. Fielder
c/o Tool Dept. Parker Electric Shops



Views of the Mechanically Operated Attendants Used to Pass Out Advertising Circulars

ROBOTS TO PASS CIRCULARS AID ADVERTISERS

Mechanically operated manikins appeared in Paris recently to aid an advertising campaign. One handed out circulars from a tray, performing the motions smoothly and accurately.

BRASS IN USED-UP LIGHT BULBS SALVAGED WITH "THRESHER"

Burned-out electric-light bulbs, usually discarded by the householder, are considered so valuable by an eastern company that it has constructed a special apparatus for breaking up the bulbs to obtain the brass shells, the only part worth saving. The machine is driven by an electric motor and is simply a revolving steel cylinder perforated with many holes, to allow the broken fragments to fall through, and having two long steel bars inside covered with projecting prongs. From 300 to 500 bulbs are dumped into the barrel at one time, the cylinder is revolved at high speed and the glass, filament, wires and even cement are knocked from the brass shells.

2812
Goulets et Antornates
Francais, 36 me
Montmorency, Paris, III France
New York Edison Co
Long Place #15 St
New York



Soundproof Camera Cover Stops the Grinding of the Machine from Being Recorded on "Talkie" Film

SOUNDPROOF MOVIE CAMERA AID TALKING PICTURES

To keep out foreign noises, engineers have had to muzzle the movie camera in filming scenes for the talkies. A special insulated covering prevents clicking and grinding sounds from reaching the sensitive microphones.

FLYERS MAKE THE DESERT BLOSSOM

Large areas of cut-over timber land in the Pacific northwest are being sown to grass by means of airplanes which fly over barren tracts and distribute the seed from a special hopper. It falls over a wide path, blown by the propeller blast. From 150 to 200 acres a day was the performance of one pilot. The best

that a man on foot could have done over a similar territory would have been five to eight acres a day. Even with the high cost of operating a plane and hiring the pilot and equipment, the air method of seeding is cheaper than by hand, owners of the land report. The sowing is done, wherever possible, on land that has been burned over recently.

STOVE SMALL AS A WATCH

2571 BAKES OIL ROCK

Rock samples that may contain oil are being baked in a small stove no larger than a watch at an eastern laboratory. Its oven is about the size of a quarter. A slice of rock, so thin that 1,500 slices side by side would measure only an inch, is placed in the tiny oven and, as the heat is applied, any minute changes that occur are noticed through a special microscope. As the stove gets hotter, some of the ingredients are seen to give off liquids varying from light oils to tarlike residues. From these tests, better methods of distilling oils from rocks are expected.

GALLOPING PONY FOR CHILDREN GIVES GOOD EXERCISE

2501



Combination of Hobby-Horse and Scooter That Runs Forward as the Rider Moves Up and Down

Sport and healthful exercise are afforded children by a mechanical horse that performs a galloping action as soon as the rider jumps into the saddle. The wheels turn and the seat goes up and down through the operation of springs. The movement exercises the muscles of the back and abdomen; the horse is easy to steer and stop and is of sturdy construction. The handlebars serve as reins for the horse, which can be used in the house as well as outdoors.

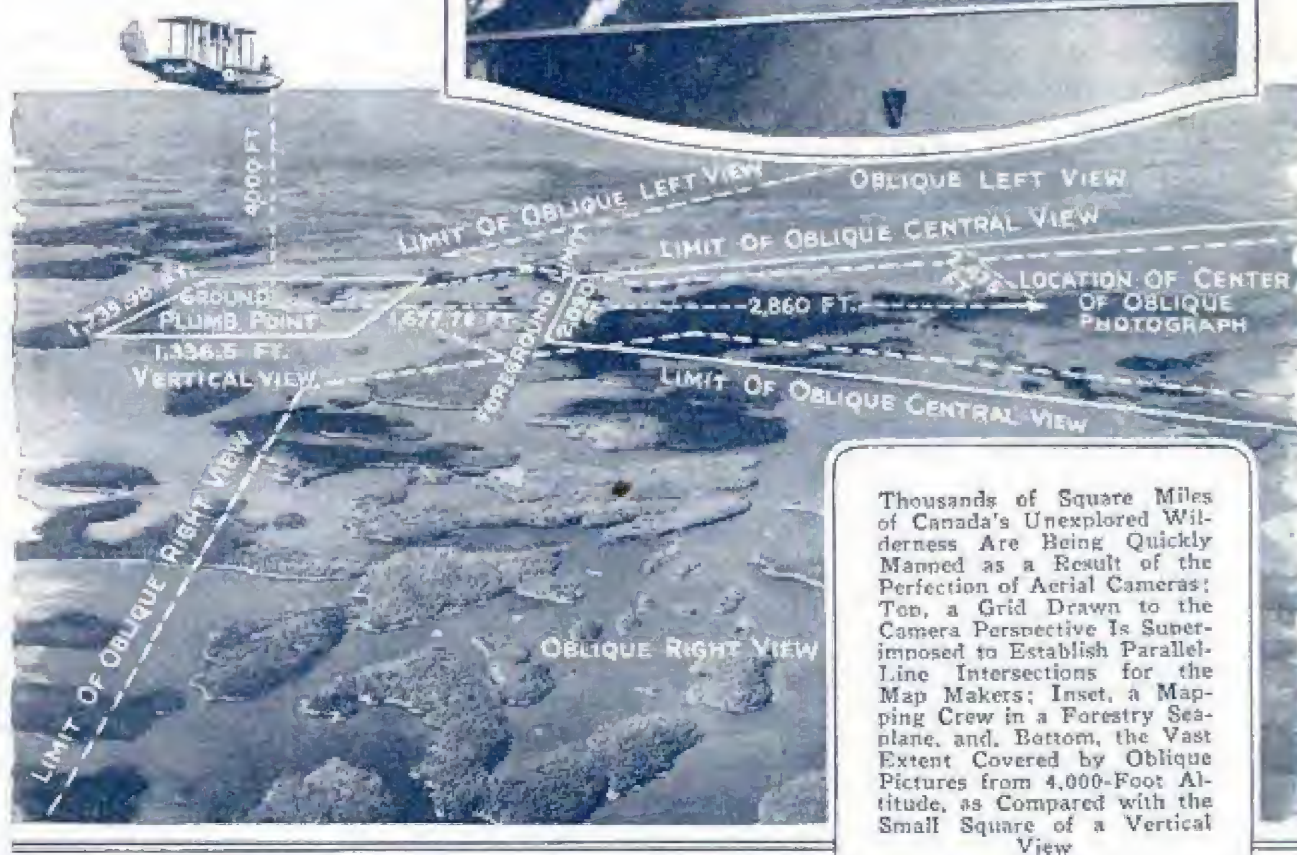
Merrie O. Toy Corp.

Paramount Studios 5457
Marathon St. Hollywood, Calif.

American Petroleum Institute

Merrie O. Toy Corp.

2574



Thousands of Square Miles of Canada's Unexplored Wilderness Are Being Quickly Mapped as a Result of the Perfection of Aerial Cameras; Top, a Grid Drawn to the Camera Perspective Is Superimposed to Establish Parallel-Line Intersections for the Map Makers; Inset, a Mapping Crew in a Forestry Seaplane, and, Bottom, the Vast Extent Covered by Oblique Pictures from 4,000-Foot Altitude, as Compared with the Small Square of a Vertical View



© P. & A.

Transmitter That Sends Moving Pictures Either by Wire or Radio; It Is the
Invention of an Hungarian

MOVIES BY WIRE OR RADIO FROM SINGLE SET

2517

Motion pictures may be transmitted by wire or by radio from an apparatus which an Hungarian inventor is reported to have demonstrated successfully in Berlin. The outfit is relatively simple and permits a quick and easy change from wire transmission to radio.

TOOTHACHE UNKNOWN TO CATS AND DOGS OF EARLY TIME

2517

Study of the teeth of the saber-tooth cats, and of the giant wolves that lived and died in prehistoric times, has shown why these animals and their descendants knew no such thing as toothache. Examination of teeth found in asphalt pits in California revealed that, in every case, the teeth of an adult of the species had only a scanty supply of nerves. As the animal grew up, the root canal, which is the main route for the nerves into the pulp chamber of the tooth, became comparatively shut off. The pulp chamber, with its filling of sensitive nerve tissue, grew very small. The nerves that reached the chamber were only the

small fibers that penetrated the tooth by minute channels. Since there were no nerves, there could, of course, be no toothache. This condition has been passed on to the descendants of the early species, examination of the teeth of modern animals shows.

PIPE WRENCH HAS GRIP LIKE HAND

2494

Fitted with a toothless girth that grips in somewhat the same manner as a human hand, an improved pipe wrench has been placed on the market. It does not damage the pipe, saves lost motion and can be used in difficult places. The slightest motion of the handle affords a new hold, and the wrench is said to make or break the tightest joints. Being without teeth, it will not chew brass or other pipe. Its ratchet action permits its use in difficult places. The girth of the wrench is easily attached to the handle.



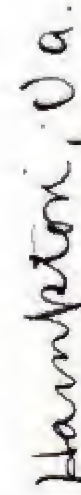
Even Soft Brass Pipe Is Not Injured by This Wrench,
Which Grips like a Human Hand

Science Service Bulletin

4178

3/22/49

The Walworth Co
tatter 12/2/49



One of the Most Spectacular of the Modern Craft of the Skies; a Giant Sikorsky Amphibian Plane of the Type Now in Use over Long Island

what like the snapping of a whip. One solution of the matter has been offered in wrapping the metal propeller with something like soft rubber. The scheme appears to have merit but, Mr. Carroll points out, no one has suggested exactly how to apply the rubber and make it stay on. Even when the engines are throttled down and the windows of a cabin plane are closed, there is considerable noise made by the passage of the ship through the air. As yet, proper methods of insulation have not ~~been~~ adapted to planes, and the problem of noise is one that engineers will discuss with keener interest in the near future.

2377-110-120 roll
ELECTRIC SET FOR KITCHEN
IS SIX TOOLS IN ONE

Operated by current from a lighting socket, a set of electrical appliances saves the kitchen worker time and trouble. It consists of a beater, whipper, grinder for sharpen-



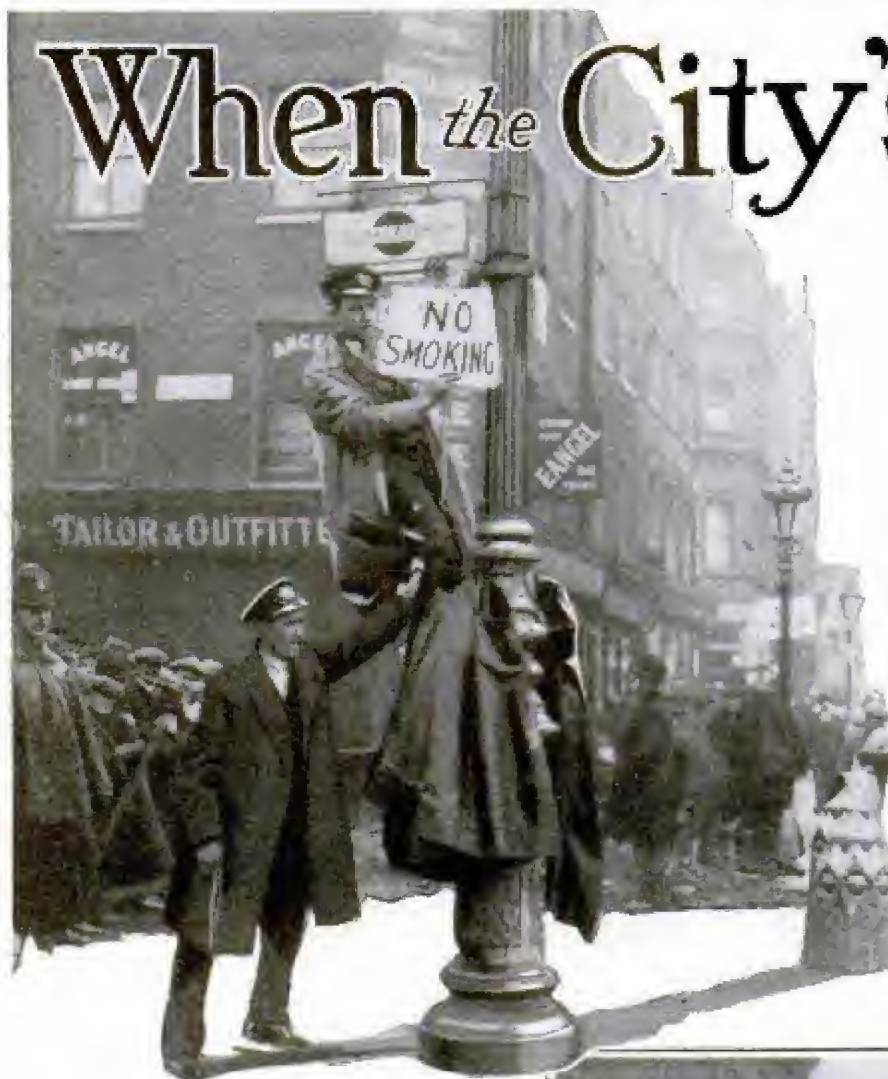
squeezer for fruits, a beater, whipper, mixer, polisher and a grinder for sharpening knives and other tools.

Science Service
New Bulletin 416 a

260. All appliances
C. 77 1st Mahan

1/5/29 P.M.

When *the* City's "Pie-



sixty years ago and originally used as a pneumatic-tube package-delivery system. Years ago, it had been taken over by the post office department, which also operates the telephone and telegraph systems, and used as a conduit for wires. Two workmen removed a manhole cover and one descended to close a switch and start the motor-driven fans to clear the tunnel of sewer gas. There was a roaring blast and his body, enveloped in flames, shot out of the manhole. Apparently the explosion spread down the tunnel, feeding on the accumu-

ARE modern cities pie crusts forming an insecure covering over a labyrinth of subterranean tunnels, pipes, wires and sewers which are potential agencies of destruction?

That question has been agitating London for months, following a series of explosions which began shortly before Christmas and continued almost daily, sometimes at the rate of a dozen or more a week.

The first and worst was a triple blast that ripped open more than a mile of street, killed one man, upset and destroyed a taxicab, and then set fire to the offices of the British film company and, feeding on the stock of movie film, gutted the building.

The blast occurred in an old iron-plate tunnel, built more than



Posting "No Smoking" Signs in the Danger Zone after London Explosions, and Firemen in Gas Masks Tackling the Fires

© Quick Picture, Ltd.

Crust" Breaks



© Quick Picture, Ltd.

An Overturned Taxicab Burning in a London Street Following the Holborn Gas Explosions, and, in the Background, a Film-Company Office Building, Which Also Was Destroyed

lated gas, until, nearly a half mile away, a second manhole erupted into the air, upsetting a passing taxicab, and, some distance farther on, a third blew up and set fire to the film headquarters.

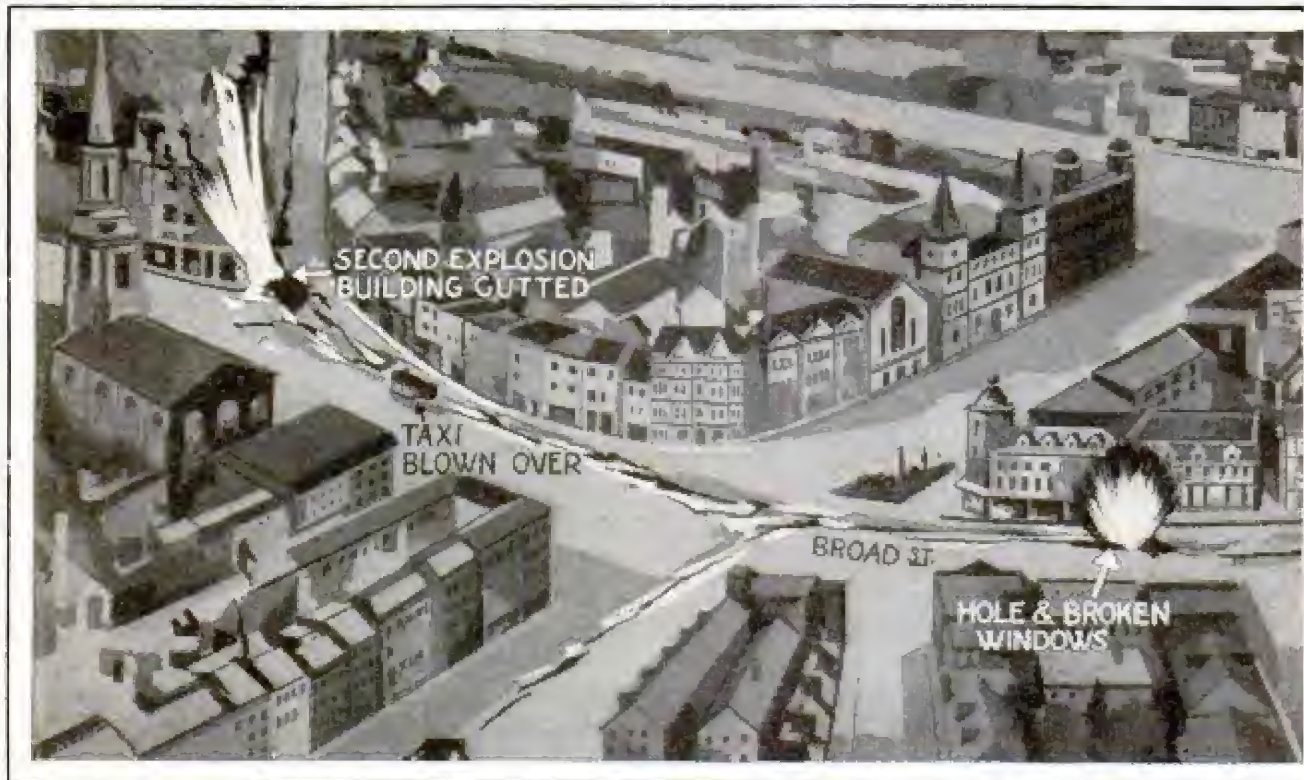
The cause of the blasts, after an investigation, was decided to have been the presence in the tunnel of fermentation gases from decomposing material in the surrounding ground. Much of London is built over an old marsh area into which the Thames backwaters fed in Roman times, which accounts for the difficulty encountered in getting stable foundations for large buildings.

The gas, akin to methane or marsh gas, which is seen sometimes flickering over marshy ground, filtered into the tunnel through the rusting iron plates (it was built before the day of concrete), and when the workmen were called after neighbors had complained of the odor,

the entire tunnel system was charged with explosive, waiting only for a spark to touch it off.

At first it was thought the closing of the electric-blower switch caused the spark. The switch was so located that it was necessary to climb down an iron ladder to reach it. After the fire, however, investigators discovered the switch was open, and apparently had not been closed. It finally was decided the ladder, the fastenings of which were loose, had swayed as the workman descended and brushed against the tunnel wall, striking a spark.

The blast ripped open the street in places, and at others bulged the paving into the air without breaking it. Gas mains alongside the tunnel were broken and added their supply to the flames, which raged up and down the street. The inflammable mixture of air and gas was so thick that "No Smoking" signs were



How a Street Explosion Spread Both Ways; the First Blast Is Shown on the Opposite Page; the Second and Third Explosions, the Last of Which Burned a Building, on This

posted for blocks around, and workmen passing into the danger zone were equipped with gas masks.

In the following weeks street blasts were of almost daily occurrence. Sometimes it was gas mains, sometimes water mains and at other times sewers. That they came with such startling regularity added to the mystery. The best explanation offered was that the majority of the old metal pipes had been laid at approximately the same time and, through rust and electrolysis, wore out at the same time. Electrolysis, or the chemical decomposition of metal by stray electrical currents, has been a baffling problem ever since the introduction of street cars and underground electric wires became common. Current flowing through the grounded street-car rails has a tendency to stray off to parallel metal pipes, and the result is a chemical action which eats holes in the pipes. Gas and water mains have been the chief sufferers in this country. In London, the electric-railway companies in the past have paid considerable damages to the gas and water companies for such damage.

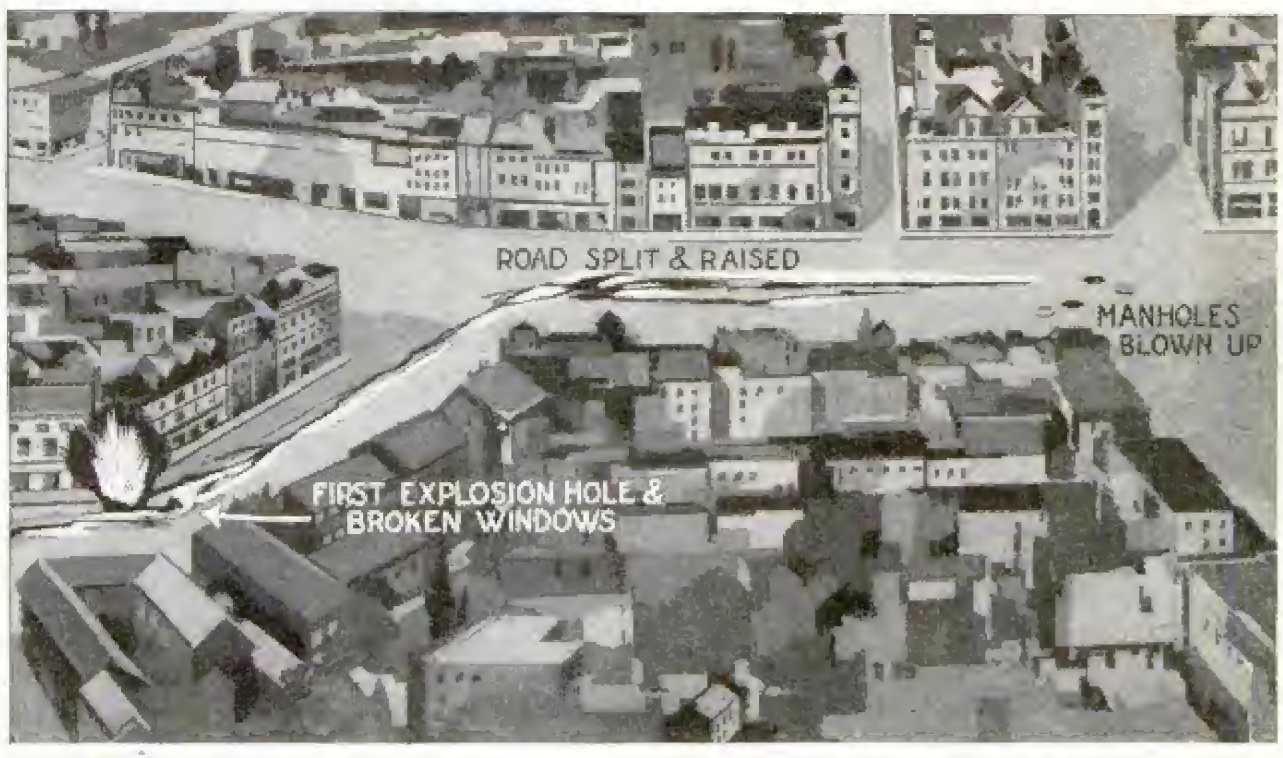
One result of electrolysis, in addition to the eating of holes in metal pipes, is the production of explosive gases through the decomposition and chemical change

of the metal. If confined in underground cavities, these gases can become highly dangerous.

One of the engineers who has helped dig most of the underground tunnels in London declared after the first explosions that, "London is standing on a pie-crust foundation. The honeycomb of tunnels underneath the city is the most intricate in the world, and unless a halt is called, thousands of lives might be imperiled.

"During the last three years, hundreds of miles have been tunneled by electricity concerns, the post office and railways. The explosions this week may prove to be in the nature of a blessing. Had they occurred in certain parts of London, whole streets might have fallen down. And the important factor at the moment is that such explosions are possible in areas where the foundations are tunneled like a rabbit warren."

The foundations of London, particularly in the central business district known as "the City"—the part over which the Lord Mayor presides—has been a problem of concern for some time, as a result of the discovery that St. Paul's cathedral was in imminent danger of collapsing. Work to save Sir Christopher Wren's famous masterpiece has been under way, largely through forcing concrete into the founda-



The Series of Blasts Finally Died Out When Sufficient Manhole Covers Had Been Blown Off to Release the Gas from the Tunnel; Roads Were Ruined by the Underground Disturbance

tions and tying the pillars and dome together with massive chains, as illustrated recently in *Popular Mechanics* magazine.

The secretary of the institute of civil engineers said, in commenting on the series of explosions:

"The perils of London's underground system have been the subject of intense investigation since the St. Paul scare. This research is still proceeding, and, even at this stage, no engineer can express an opinion—because he might be wrong."

Other engineers said the tunneling system, for everything from subways to electric conduits, was started at a time when no one could have anticipated the immense increase in street traffic which has followed the invention of the automobile, and has continued apparently without regard to the changing traffic conditions. One cause of danger is claimed to be the older post office cables of telegraph and telephone wires. Those laid years ago were put in wooden troughs, filled with melted tar. As a result, the production of explosive bitumen gas from the tar is a constant menace. A short circuit from other electrical conduits or apparatus may be sufficient to produce the spark necessary to touch off this gas.

A month after the first explosions, two big gas mains blew up within a few days

of each other. Commenting on the occurrence, one of the London papers presented figures showing more than one thousand miles of underground tunnels under the city. A new danger was cited by some of the engineers interviewed, who declared the pneumatic drill used to break up paving could do more damage to the underground structure, through vibration, in a single day than an entire year of traffic could cause.

"London is roofed in far more than it was a few years ago," another engineer pointed out. "What were once back gardens in central London are now covered in by the vast-span roofs of garages, workshops, factories, and innumerable structures on which rain falls, and is carried direct to the sewers, instead of sinking into the earth.

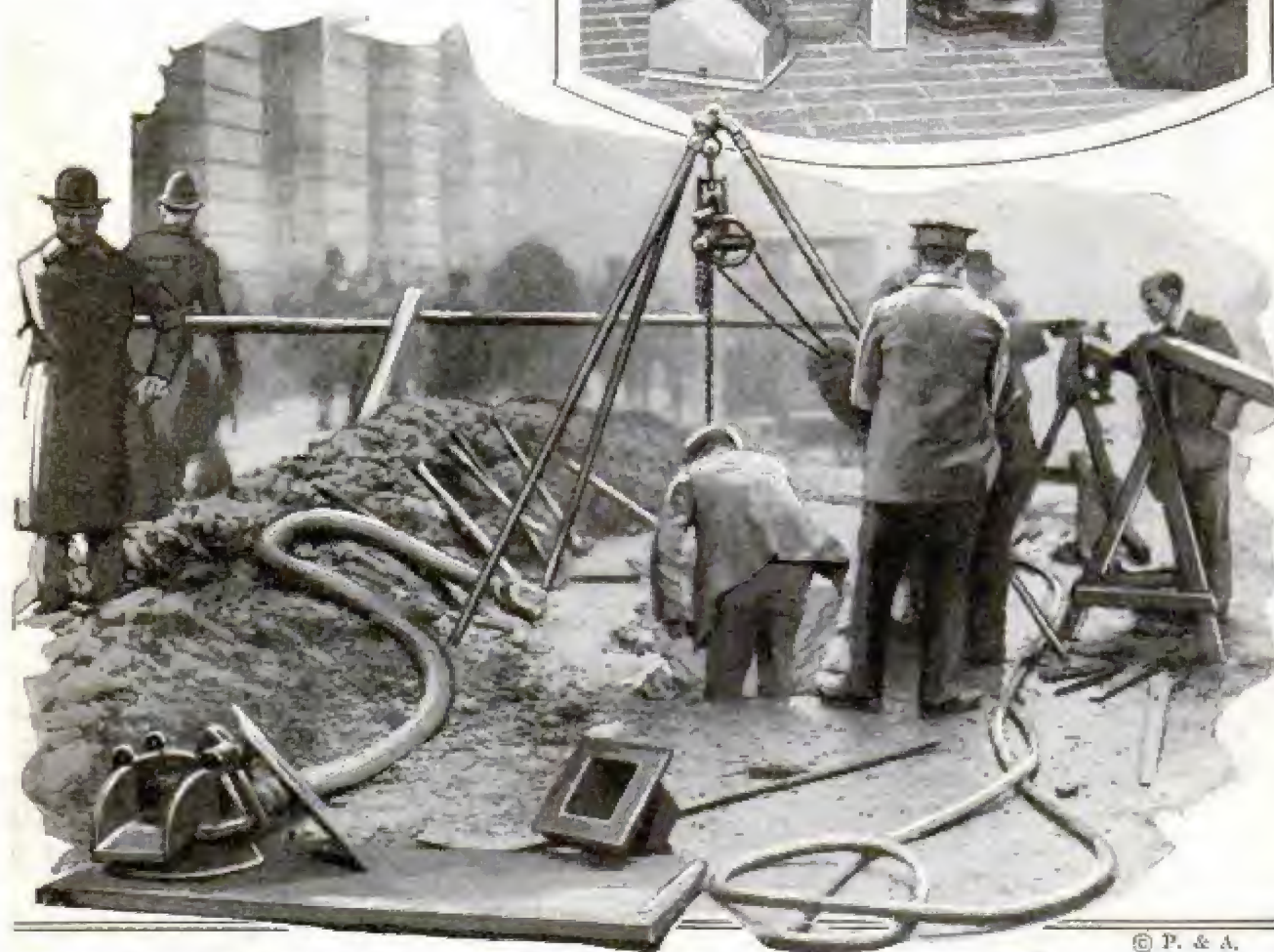
"So completely has London altered in recent years that the sewers are quite inadequate to carry any heavy fall of rain, with the result that, below the road surface, the water is exercising a terrific strain on the sewers, and in many instances heavy leakages have occurred at weak points.

"The escaping water finds an outlet into soil which has steadily been getting drier as more roads are ceasing to be of the old macadam type. Each year, more

roads are paved with wood, asphalt, or concrete, through which no rain water can get to the soil immediately below, and while this soil becomes dry, the soil some feet lower down is being washed away by leakages from overfilled rain sewers.

"This causes the dry soil to shift, and in many places, under pavements and roadways, cavities have appeared near gas mains and other heavy pipes which sag or shift when the ground around them becomes disturbed."

This problem is not confined to England. Every big American city, and many smaller ones, has



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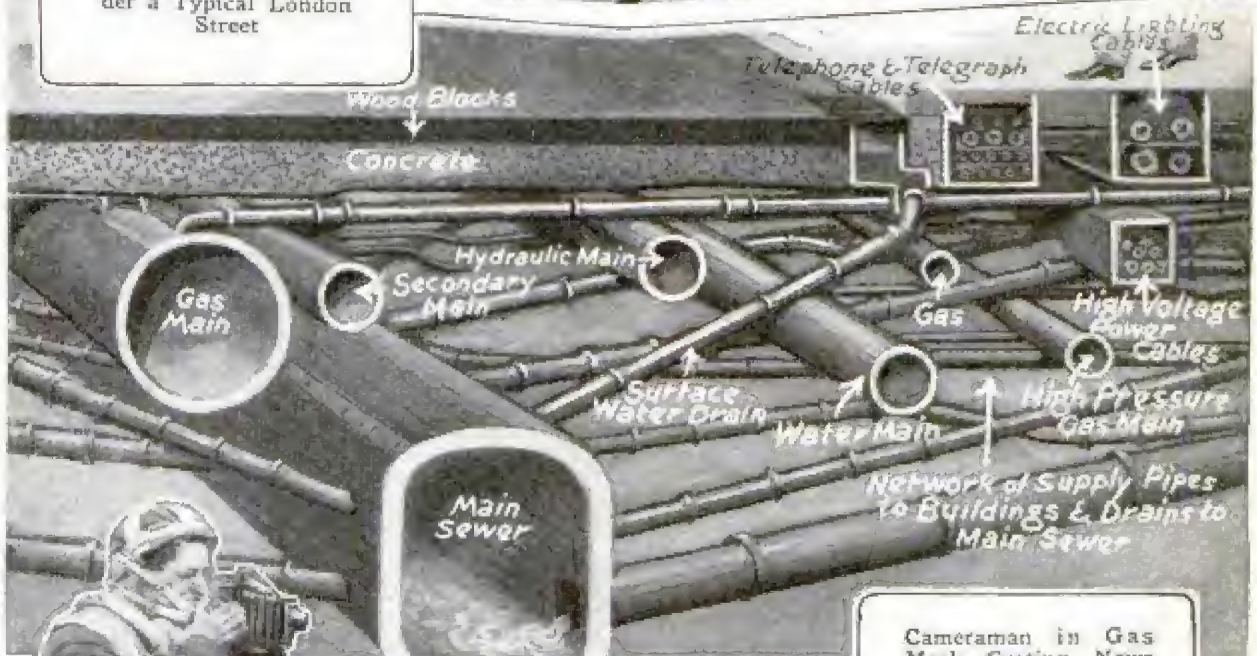
Testing a Sample of Rubber Paving. One of the Suggested Means of Localizing Traffic Vibrations, and, Below, the Scene Following the Bursting of a Big Water Main

had experience with such accidents. After drying out beneath the pavement for some years, the soil apparently becomes so pulverized that, when water does reach it, it is easily washed away, some probably filtering through cracks in sewers and other

pipes. That leaves an underground hole, and sooner or later, the constant hammering of heavy traffic, supplemented by the presence of more water, will wear away the street's foundations until the paving falls in.



Part of the Wreckage of Holborn High Street and an Overturned Automobile, Top, and, Below, a Section of Pipes under a Typical London Street



Camerman in Gas Mask Getting News Pictures in Wrecked Street Following the Explosion of an Underground Tunnel; Heavy Concrete Was Broken into Small Bits as the Terrific Blast Below Ripped Up a Mile of Street, Overturned Cars and Set Fire to the Gas Mains



Hunting for a Gas Leak: London Became So Alarmed, Every Smell of Gas Resulted in an Immediate Digging Expedition to Locate the Source

"Absolutely nothing can be done to insure that further gas and water mains will not blow up or burst," Mr. John Todd, the district surveyor of the City of London, declared during the recent series of explosions. "There is no remedy—no precautions to take. We must just wait, hoping there will not be a 'next'." It was Todd who discovered the condition of St. Paul's and served notice on Dean Inge that it was a "dangerous structure" and would have to be repaired or closed to the public.

"The authorities are unable to take any precautions or suggest any measures to obviate further accidents," Mr. Todd continued. "We believe the mains are in good condition, and, therefore, there is nothing but the heavy overload traffic to lead us to expect further accidents. The ever-increasing traffic puts a mighty strain on the mains, and this is considered to be the only reason for the accidents which have already occurred.

"But what can be done? The roads cannot be cleared of traffic, and it would be an almost impossible task to open up London to inspect the hundreds of mains which run in all directions. Such a scheme would take years to complete, the whole life of the city would be stopped, and the

cost would amount to a staggering number of millions of pounds."

One result of the London accidents, however, has been the centering of engineering interest on the problem. While mains and sewers and subways, already down, may not be opened for inspection or change, it is probable that something new in the way of underground tunnels and conduits may be developed to cope with the increasing traffic load.

American cities, because of their more modern buildings, and because skyscraper foundations usually are built down to bedrock, have had less trouble from street vibrations. In the

more congested sections of New York, Chicago, and other large cities, buildings more than twenty-five years old are quite rare, while the constant rebuilding that goes on, even in outlying sections, lessens the danger of weakened foundations. Another difference between American and European cities is the prevalence here of concrete foundations for large buildings.

2356 ROTARY HOE FOR GARDENER SAVES TIME AND WORK

Four tools are combined in one in a rotary-hoe unit for cultivating and weeding gardens. It includes a weed killer, cultivator and soil mulcher as well as a hoe. Operated somewhat like a lawn mower, it has reversible blades and guards for protecting the leaves of plants, and one of the cultivator shovels may be used as a marker for planting. The unit is adaptable to many tasks, is easy to operate and strongly built.



*Rowe Mfg Co
Essexburg Kans*

New England Bureau
of Service Information

24 hrs. POPULAR MECHANICS

2433

Industries Fair 937

MAGNET COMPASS FINDS PIPES IN "LOST" GAS MAINS

Successful application of the magnetic compass, the type that has been used by mariners for hundreds of years, has been made by a gas company in finding gas mains, the exact location of which was not known. By holding the compass at the surface, the deflection of the needle aided the engineers in finding the mains. The method is practical when the pipe is buried not more than two feet below the top, and in finding piping hidden in house walls.

AVIATORS TAUGHT IN A BARREL MASTER BLIND FLYING

Students at a Paris flying school take their lessons in one of the oddest classrooms in the world. It is like a half barrel and is equipped with flying instruments by which the pupil is expected to correct the motion of his compartment as it lurches and swings about. The plan is part of the method for training pilots to rely on their instruments rather than on their senses when flying through fogs or at night. It is predicted that the larger planes of the future will be operated by two pilots, one who will take the ship off and land it while seated where he has a full view of the outside, and another who is inclosed in a hooded part of the cockpit, where he will keep his eyes riveted on his instrument board and govern the plane accordingly. Experiments have shown that even a green pilot, flying blind, obtains better results than when he trusts to his reactions in the open. Changing lights, the temptation to look at the wing tips, the rattling of ice on wings and fuselage in storms; these and other factors tend to disturb the beginner.



Shelf and Book Rest, as Set on Arms of a Chair; the Hands Are Left Free

BOOK REST FITTED ON CHAIR LEAVES HANDS FREE

Easily attached across the arms of a chair, or in any other convenient position, a book rest permits the reader to work at other tasks while reading, as the hands are left free. The shelf part of the rest serves as a table for dishes or working implements such as a sewing basket.

PRESS FOR PAPER BOXES PRINTS FIFTY THOUSAND AN HOUR



Receiving a Lesson in the Barrel Classroom; Unit Employed at French School in Teaching Blind Flying

For printing and cutting paper-box cartons, a timesaving machine, introduced in a western city, has a capacity of 50,000 an hour. It prints one on both sides in four colors, cuts the paper and scores it ready for folding. It will also print colored designs on transparent wrapping material in more than one tint, something that heretofore has been impractical with certain kinds of wrappers.

Rotary Carton Machine Co. 244 S. 4th St. Minneapolis, Minn.

Rotary Carton Machine Co. 244 S. 4th St. Minneapolis, Minn.

FLOATING AIRPORT TO SERVE LINE TO BERMUDA



Sketch of the Armstrong Floating Airport, to Be Built at a Cost of \$1,500,000 as the World's First Ocean Landing Field; It Is to Be Tried on the Bermuda Run

Construction of an experimental floating-island landing field for airplanes is to be started immediately, according to Henry J. Gielow, famous yacht designer, who has been retained by the Armstrong Seadrome Development company as consulting engineer. The island, which was patented two or three years ago by Mr. Armstrong, has already been tested in model form in a floating basin. As planned, it will be a steel platform, 1,200 feet long and 400 feet wide, riding normally at least 100 feet above the waves. Six chains, each 21,150 feet long, attached to specially designed sea anchors, will hold the island in place. Forty-three men will constitute the island crew, and the equipment will include hangars, a machine shop, hotel, restaurant and a radio beacon to guide the planes to the landing stage. Six thousand tons of steel and 2,000 tons of iron will be used in the construction. The first island is to be anchored halfway between New York and Bermuda and used in experiments over that route. If it proves a success, a series of eight islands are planned to be placed between New

York and the European coast. Tests made with large Sikorsky amphibian planes show they can land on a field only sixty per cent the size of that which the island will afford.

SAFETY STAND FOR FLATIRON REDUCES FIRE HAZARD



Quickly attached to the flatiron, a stand prevents fires and keeps the ironing-board cover and garments from being scorched. It also helps to protect the current cord to the socket and, as it is permanently connected to the handle of the iron by means of hinges, it saves hunting for a loose stand. By keeping the iron from coming in contact with other metals when the current is on, the life of the iron is prolonged.

Hallingsway Sales Co.,
Box 128, Oakland

see July 1919. 26

23rd 43rd St New York
see
Circuit at Wilmington

Mr. Edward H. Armstrong
July 1929. 26

Oct. 1938 572.

April 1934-566

SIGNALS WORN BY PEDESTRIANS TO AVOID AUTO ACCIDENTS

Engineers of the General Electric company have been experimenting with various kinds of signals to be worn by pedestrians and make them more easily visible to motorists at night so that accidents will be prevented. One of the best devices tried was a white handkerchief, held with the arm full length at the side. In this position, it caught the beams from the headlights and reflected them so that the handkerchief could be easily seen, especially when it flared open. Light-colored clothing was more plainly visible than dark, and one of the chief reasons for the effectiveness of street lighting, so far as making the pedestrian visible, was that the best systems revealed a walker in silhouette. Bright headlights alone were found not to be sufficient, for, unless the clothing of the pedestrian reflected their illumination, the driver was likely to approach too close to the person before plainly seeing him.

LIQUOR STILL IN HOSPITALS HELP CURB DISEASE

Confiscated stills have been put to a useful purpose in the county hospital and jail in Los Angeles. They are adapted as inhalators for spreading helpful fumes in sick-rooms, and are also converted into washtubs and pans.



Part of an Old Still in Use in Hospital as a Vaporizer to Curb Disease



Imitation of Derby Played by Inserting Coin in Slot and Manipulating Levers

COIN-IN-SLOT HORSE-RACE GAME TESTS PLAYERS' SKILL

Some of the thrills of a genuine race track are enjoyed in a cabinet game operated by a coin in the slot. The model horses are controlled by two wheels which are turned by the players. The speed of the ponies depends upon the skill of the operators, for the wheels are fitted with governors. If turned too fast, the horses balk and stop, so that practice is needed to develop the highest possible speed.

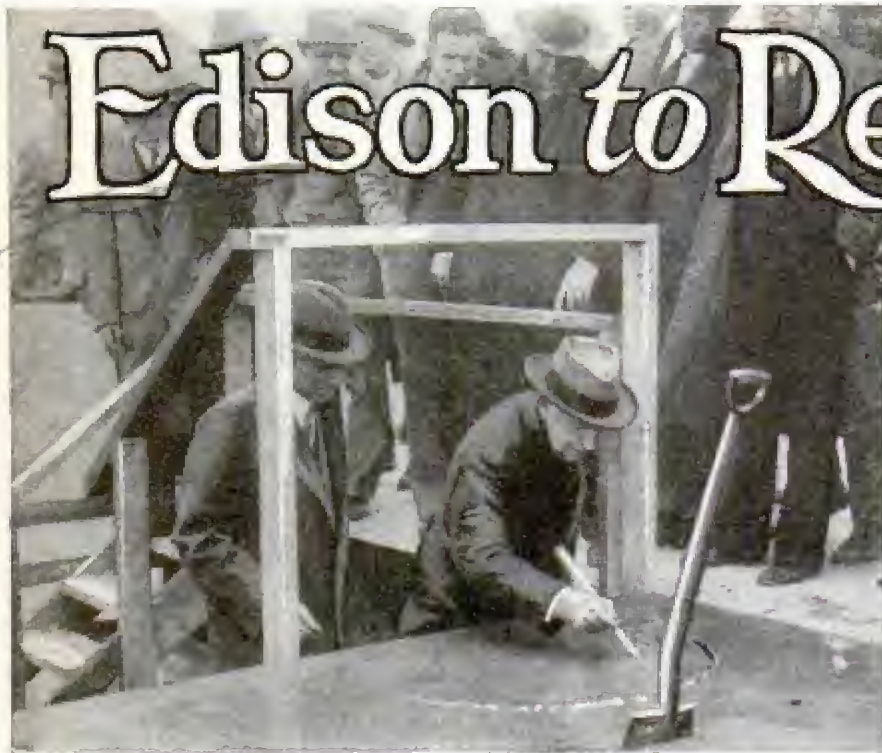
GOPHERS ON LANDING FIELD LATEST FLYING MENACE

Pocket gophers that throw up mounds of earth in digging their homes, are proving a problem to aviation in some of the western states. At the Douglas, Ariz., municipal airport, they piled up more than 2,000 mounds on the landing field. The bumps and the holes made smooth and easy descents difficult.

St. Joseph News Press
3/5/29

Chester - Pollard Amusement Co. Inc.
188 W. 4th St. New York

2436



ings on the museum proper and its grounds, indicate the vast scale and the unique character of the enterprise. The little buildings seem crude and out of place beside the modern structures near them, but this contrast only emphasizes their significance, for in some of those very build-

By PAUL D. PADDOCK

THE PAGES of history will be turned back this October, when Thomas A. Edison remakes the first electric light he invented fifty years before. Veteran assistants will help him, and the little shop in which they meet will be the same laboratory restored where the original experiment was performed, for this historic workshop and others made famous by the great inventor, have been moved to Dearborn, Mich., as a special group in honor of Edison for the vast historical collection Henry Ford is assembling to tell the romantic story of the progress of America. The keynote of the museum is suggested by the inscription above the entrance to the present Ford experimental laboratory: "Mankind Passes from the Old to the New on a Human Bridge Formed by Those Who Labor in the Three Principal Arts: Agriculture—Manufacturing—Transportation."

Only the beginnings of the undertaking are visible today, but the little clusters of frame structures, a short distance from the Ford administration building and research laboratories, and the preliminary work-



Edison Penning His Autograph in Cement, While Henry Ford Looks On, and Close-Up of Block with Luther Burbank's Spade

ings occurred events that have changed the world.

For instance, there is the original laboratory in which Edison worked for many years at Ft. Myers, Fla. It has been shipped from the south and reconstructed here with all its original equipment. Menlo Park, N. J., scene of scores of the inventor's triumphs, is being represented completely either in the original buildings, sent from the east and rebuilt here, in parts of the originals or in reproductions. Among the structures is Mrs. Jordan's



Scene at the Birth of the Incandescent Light, Nearly Fifty Years Ago; Edison Is Third from the Right; This Interesting Event Is to Be Restaged at Dearborn, Mich., This Fall

boarding house, the first building in the world to be lighted with incandescent lamps. Many of the tools Edison used in developing his inventions will be exhibited. The entire group will make clear the inventor's position as the real projector of modern American production methods and his historic contributions to our national progress, for Mr. Ford said recently, "we are ahead of all other countries today, simply and solely because we have Mr. Edison."

The celebration of the fiftieth anniversary of the incandescent light at Dearborn, amidst scenes as nearly like the original as possible, will therefore constitute a unique tribute to Mr. Edison and will stimulate further interest in the vast museum project which is scheduled for completion in approximately three years. The finished museum will mark the realization of one of Mr. Ford's fondest dreams, an idea he and Mrs. Ford developed after they had begun to restore the old Ford home near Dearborn. The thought has been extended to the nation so that, in years to come, visitors may see into the domestic and industrial life of their forefathers as closely as an individual may do

when he visits his old homestead. The chief purpose of the museum is educational, but the element of human interest is highly developed.

This human side was well illustrated when Mr. Ford obtained a memento which is to be one of the principal exhibits in the museum. Last September, Mr. Edison was his guest at Dearborn. The inventor stepped upon a block of soft concrete, inserted Luther Burbank's spade, left impressions of his own footsteps, and then wrote his name and the date in the concrete which will preserve them forever. This block will occupy a prominent place near the entrance to the museum. Burbank's original office building, by the way, has been shipped from California and rebuilt near the museum site, where, with many of his tools and examples of his experiments, it will form part of a Burbank memorial.

Passing from the reproduction of Menlo Park, the main tribute to Mr. Edison, the visitor will find himself in another group of frame buildings, "The Village," a center built around a commons such as characterized the early New England towns. There is the original Clinton Inn, pur-

chased some time ago by Mr. Ford for his collection. In houses and shops, workers, dressed in the costumes of the times, are to be engaged in the various crafts of the period. Some of the cobblestones in the streets have been brought from New England. All the buildings are furnished as they were in the early days, and each is lighted with lamp or candle, according to the period to which it belongs. There is a well with its old oaken bucket, a quaint mill with its overshot water wheel, hitching posts, vehicles of other days, including a stagecoach that will creak down the streets at visitors' hours. As nearly as possible, everything in the village is to be shown in action. One of Mr. Ford's chief aims is to avoid dead exhibitions, even though the purpose of the entire display is essentially that of a museum.

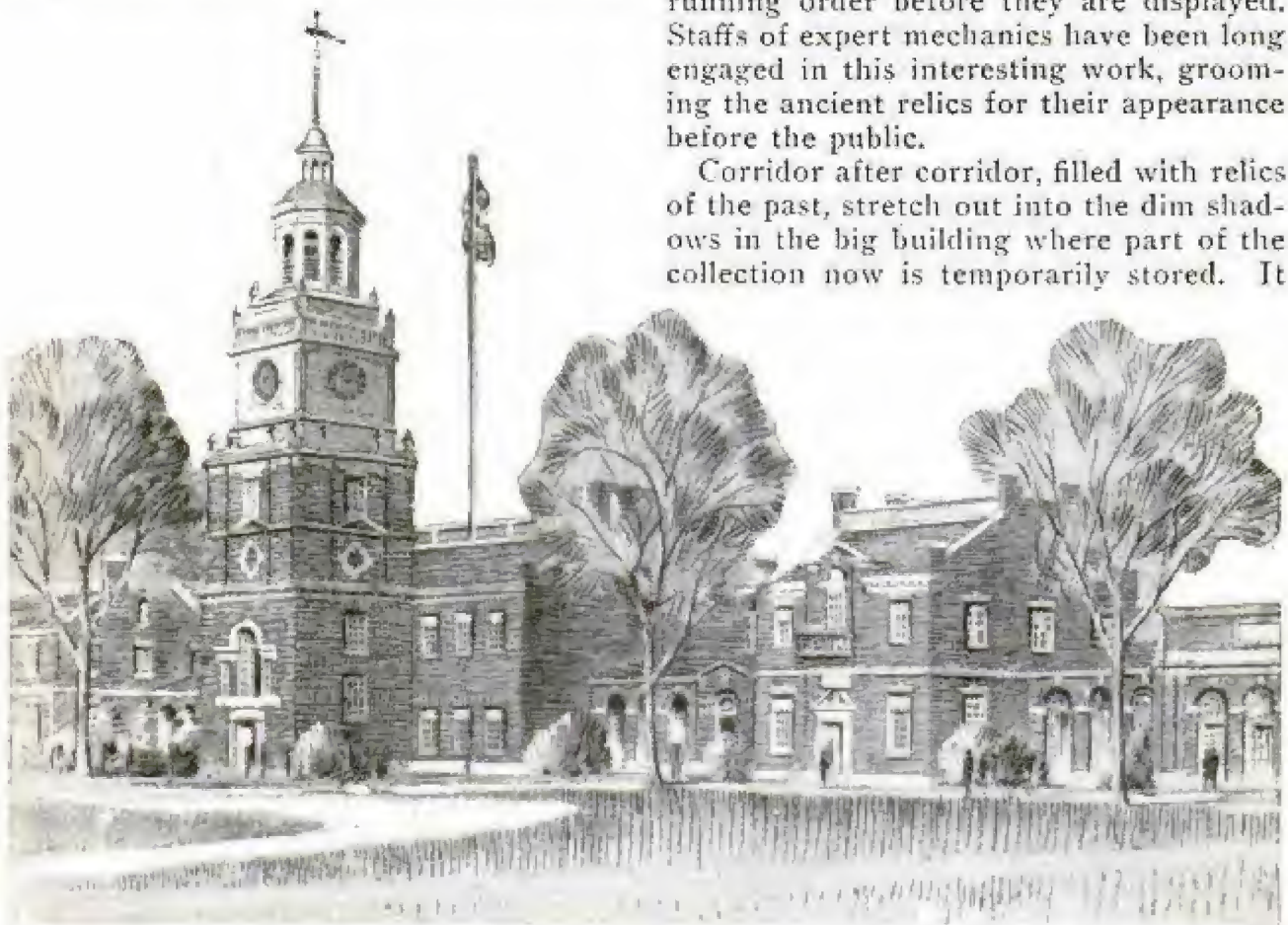
Menlo Park and "The Village" form an attractive setting for the main structure, the big museum building, which is to be a faithful replica of Independence Hall at Philadelphia on a gigantic scale. Under its generous roof will be housed the bulk



Edison and Mr. Ford Examining the Old Engine Now Running Again in the Moved Laboratory

of the great collection that Mr. Ford and his representatives have been gathering for years. One wing of the structure will be a roundhouse in which will be kept some of the locomotives to be exhibited. These trophies, representing the development of our railroads from earliest times, as well as other machines, are to be restored, repaired and otherwise put in running order before they are displayed. Staffs of expert mechanics have been long engaged in this interesting work, grooming the ancient relics for their appearance before the public.

Corridor after corridor, filled with relics of the past, stretch out into the dim shadows in the big building where part of the collection now is temporarily stored. It



Architect's Drawing of Part of the Front of the Huge Ford American Museum Now under Construction at Dearborn, Mich.; It Will Be a Faithful Reproduction of Independence Hall on a Gigantic Scale

is as though thousands of attics and store-rooms had pooled their treasures in one huge display, to tempt the caller on an endless afternoon of pleasant exploration and rummaging. Rows upon rows of fine old chairs, secretaries, beds and other furniture, glassware, cutlery, pewter, spinning wheels and clocks. An old-fashioned music box tinkles a mellow tune while a collection of wooden Indians, such as once guarded the cigar-store entrance, gaze stolidly ahead. Sleighbells, horsewhips and harnesses, buggies, wagons and sleighs, lamps, candlesticks, and quilting frames, lathes of every age, including one of the primitive type that was worked by a rope fastened to a sapling, cooking utensils dark from a hundred fireplaces, dolls, cribs, cradles and trundle beds—these, and thousands upon thousands of other articles, all waiting for the day when the doors of the big museum will swing open upon the romantic tableau of human progress.

Many of the objects have personal associations. One of these is a sap bucket, fashioned by former President Coolidge's grandfather, and given to Mr. Ford by the former chief executive. This bears Mr. Coolidge's autograph and also that of the Prince of Wales. Another is a baby jumper in which Henry Wadsworth Longfellow learned to walk. The collection also includes the old lunch cart in which



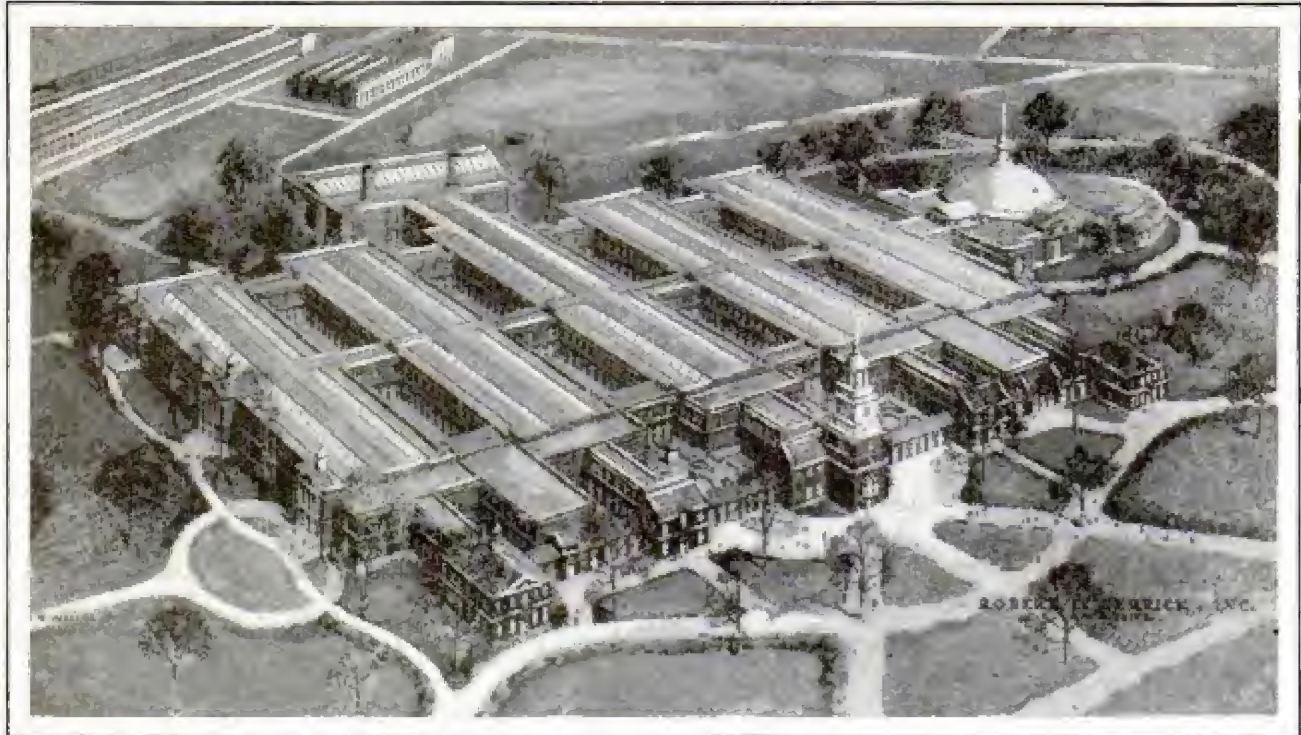
Model of Edison's First Incandescent Light in Holder, Being Compared with a Recent Bulb

Mr. Ford took many meals when he was learning the machinist's trade in Detroit and the ancient Dearborn band wagon in which the Dearborn band toured the country giving patriotic concerts during Civil War times. Mr. Ford's uncle, also named Henry, played fife in that band. There is Mr. Ford's first desk, his first lathe and, of course, a complete collection of all the Ford motors from the first to the latest.

Of special interest will be the display of steam engines and electrical apparatus



Another View of Elevation of the Museum; the Edison Autograph in the Cement Block Is to Be Displayed in a Prominent Place at the Entrance to the Main Building



View of the Entire Building; Since This Sketch Was Made, It Has Been Decided to Inclose the Area under One Roof, Instead of Several as Shown; Note the Roundhouse for Locomotives at Right

of all kinds. The various pieces will all have been restored to running order and will be arranged in an ascending scale, that is, in the order of their development, so that the visitor can visualize, at a glance, the progress that has been made throughout the years. This collection of engines and other machines already has been put to practical use from time to time at the Ford works. When a supposedly new principle in mechanics is introduced, or there is some doubt as to an old one, the old engines themselves are consulted and, more than once, highly trained mechanics and engineers have been surprised to discover that an idea they had supposed to be original with them, had already been adapted years before.

EVIDENCE OF NOAH'S FLOOD FOUND BY SCIENTISTS

Evidence supporting the story of the great flood of Noah's time, as related in the Bible, has been uncovered on the site of the ancient Sumerian city of Kish, in Mesopotamia, by members of the Field Museum-Oxford University expedition. Indications are that the city was destroyed not once, but twice, by inundations similar to that described in the book of Genesis. Scientists estimate that the first flood oc-

curred about 4000 B. C. and the later, the one in which, according to the Bible story, Noah saved the human race, happened about 600 years later. Kish was rebuilt after each flood, and relics of the successive habitations are found in the different strata through which the explorers have dug. The remains of the original city were uncovered at a depth of fifty-five feet, ten feet below the second. Scholars are at work deciphering inscriptions on some of the tablets found among the ruins, in the belief that further light may be shed upon the civilization of those times.

SAFETY LATCH FOR PLIERS PREVENTS SLIPPING



To keep the jaws of the pliers from slipping off the work, a western inventor has introduced a safety latch or dog that keeps them in place. The attachment does not interfere with the regular operation of the tool and is easily and quickly set for service.

Chicago Tribune
3/19/29

Wm. H. Lotter, 438 Laurel

2451

FANS OF LIGHT GUIDE FLYERS IN MAKING LANDINGS

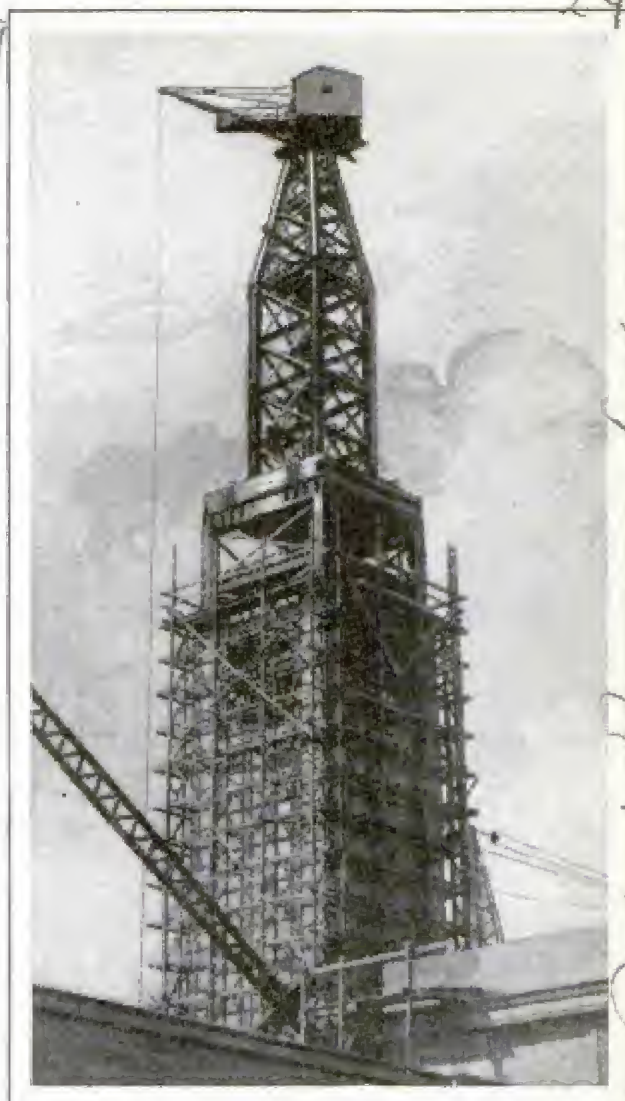
Rotating fans of colored lights, which can be adjusted at different angles, are now in operation at the Cleveland municipal airport, to help direct pilots to a safe landing. Half of the beam is white and half red, producing alternating flashes that distinguish the lights from those of the parks and other places.

"CLOCK" TO RUN FOR CENTURIES —SHOWS RADIUM'S POWER

It doesn't tell time, yet scientists call it a clock and it is expected to run for centuries without any attention. It is a radium unit, a vacuum tube, inside of which is a small cylinder of the mysterious substance. As the radium disintegrates, it charges two gold leaves with electricity. They gradually diverge until they touch the sides of the vacuum tube where they discharge their electricity and drop down. This action is repeated every thirty-four seconds and will continue as long as the radium is active. This is probably one of the nearest approaches to so-called perpetual motion yet developed. Scientists estimate that at the end of 2,000 years, the "clock" will still be running, although the cycle of the gold leaves will be performed but once every sixty-eight seconds.



Radium "Clock" That Needs No Winding and Is Expected to Run for Centuries



Steel Tower under Construction in Australia; the Crane on Top Saved Builders Time and Labor

CRANE ON TOP OF HIGH TOWER ELIMINATES SCAFFOLDS

That modern methods of steel construction are followed in Australia as well as in other parts of the world is illustrated by the accompanying photograph of the town-hall tower under process of erection at Brisbane. A crane was installed at the peak of the tower, 300 feet above the ground, saving the task of building a system of scaffolding. The corner stone of this interesting structure was laid by the Prince of Wales in 1920, and the work is expected to be finished this year.

[The Popular Mechanics' Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished.

*and Robert Ravnagh Farm
Road, Newmarket Brisbane
Queensland Australia*

*Mr. Frank Edward Simpson
69 Madison Chicago*

On the Trail of the

By H. R. HILL / 653

Le Roy Ave. Berkeley, Calif.

AS THOUGH shot from a catapult, a tawny body goes hurtling through the air. It is a California mountain lion bent upon a kill, the intended victim a motion-picture cameraman.

"Click-click-click." True to the tradition of his calling, the cameraman continues steadily to grind, although death is but a split-second away. Then, in a flash, the heavy camera is shoved to one side, the man falls prone to the ground, and 150 pounds of steellike muscle, fangs and claws pass safely overhead.

As the lion strikes the ground, rebounds and leaps swiftly away into the forest, dogs baying madly at its heels, the cameraman rises to his feet and hastily inspects his costly camera. And another thrilling incident is closed in the career of Sidney A. Snow. The vicious leap of the lion has been filmed, the camera escaped injury, and last, if not least, the cameraman himself emerged with a whole skin.

For this is no movie scene with a hair-breadth escape accomplished by means of double exposure. It's the real thing, too real at times for comfort. Snow, son of the late H. A. Snow, the big-game hunter, has been engaged for four years in the filming of the California mountain lion in its native haunts. It is a task to try the courage of the hardest hunter.

With J. C. Bruce, official lion hunter of the California state fish and game commission, Snow has engaged in some sixty expeditions into the mountainous region east and south of San Francisco bay. With camera equipment varying in weight from twenty-five to one hundred pounds, which he is often obliged to carry through dense thickets and up steep mountainsides, he has followed the veteran Bruce and his trained dogs over hundreds of miles of trailless forest. Hard work, excitement and adventure—that describes Snow's amazing project.

The California mountain lion is at once

Oakland Calif.

A Strip of Sidney Snow's Movie Film of a Young Mountain-Lion Cub Treed by the Dogs and Getting Ready to Put Up a Fight.

Mountain Lion

the most difficult and dangerous animal subject in the world for motion-picture purposes, says Snow. And he speaks with no slight authority, most of his thirty years having been spent on the trail of big game, first in Africa with his father, next in the arctic. African lions and polar bears alike have fallen before his rifle and been filmed by his movie camera. He "shot" the roping of a full-grown polar bear, and the beast now is in the municipal zoo of Snow's home city, Oakland, Calif.

But neither the king of the jungles nor the monarch of the ice floes are comparable to the California mountain lion in pure viciousness, wariness and general cussedness. Bruce holds what is believed to be the world's record for mountain lions killed—348 in all—and the killings of many of them have been recorded on the celluloid by Snow. But the ambition of this young camera hunter goes beyond the mere killing of the predatory beasts. He wants to "shoot" the spectacular scene



Sidney Snow "Shooting" a Treed Lion, and, at Right, a Member of the Party Who Picked Up More Than an Armful When He Gathered in an Angry Young Lion Cub



With a Young Lion off the Ground and Trying to Fight Off the Dogs, Bruce Has a Busy Time

of a full-grown male lion being roped from a tree!

Incredible as the feat may sound, Snow and Bruce believe it to be possible. In fact, they once succeeded in getting the loop over a lion's head, but the beast, maddened with rage, leaped to the ground with such force that its neck was broken.

The roping of a mountain lion has a technique all its own, the foundation of which is earthquake-proof nerves. In the first place, a lion always takes to a tree when pressed by the dogs. Generally it crouches on a limb well above the ground, there to survey its enemies below with baleful yellow eyes that seem fairly to shoot fire. Bruce then prepares a loop which he hangs on the forked end of a long pole. Snow meanwhile has found an advantageous position for his camera.

The trick is to place the loop over the lion's head, draw it tight and drag the snarling beast to the ground. Should Bruce be unable to reach the lion, he endeavors to climb the tree, and often the dogs try this same stunt. The lion, growling and spitting after the manner of cats large or small, bats the loop away with one mighty blow of its forepaw.

Vision this scene: Bruce has climbed part way up the tree and essayed unsuccessfully to loop the lion. The rope, slapped repeatedly by the lion, has become snarled in the fork of the stick. So Bruce starts to climb back down the tree.

Snow is grinding away at his camera. Suddenly, the lion has turned and now is stalking Bruce, slipping down the tree behind him, preparing to spring as he gets clear of intervening limbs.

A shout—a flash of tawny hide! Bruce from the corner of his eye glimpses the leaping lion. He lets go and drops, leaps to safety. The dogs close in and he is safe.

Meanwhile, Snow has been filming the near tragedy. Not once does he stop turning the crank, for he knows that here is a picture which may never be filmed again—a man in a tree being stalked by a mountain lion!

Dangerous? You bet. But Snow and Bruce have discounted that phase of their strange profession. Snow's African and Alaskan experiences are standing him in good stead in the filming of this story of

Karl Schapel
5035 Fair Ave. N.
Hollywood
Calif

wild life. In fact, without that background, he says, he would not be able to withstand the strain of it. As for Bruce, that famous hunter was born and bred in the mountains; he is reputed to know more about the habits of the mountain lion than anyone living.

Action! There was plenty of it the time the big male lion, measuring seven feet, leaped full at Bruce and Snow. Snow managed to evade the death-dealing slash of the powerful paws. Bruce and the lion struck the ground in a whirlwind of dust and leaves. Snow's younger brother, Homer, who often goes on these expeditions, stood, with pistol in hand, prepared to come to the rescue of anyone in trouble. There was plenty of trouble now, but nothing could be done about it. To shoot the lion might mean to kill Bruce.

But Bruce, a powerful six-footer, was equal to the occasion. Knowing that in the next instant he might be soaring into eternity with a crushed head or backbone, he managed with one superhuman effort to draw his revolver. Blindly he fired upward. The lion, with a last agonized cry, rolled over dead. Not always are the scenes so fraught with possible tragedy. Bruce delights in capturing alive the half-grown lions he encounters, and for this purpose he has mastered a method. While the young lion stands at bay, Bruce ropes it by the hind feet which he lifts from the ground with one hand. With the other he grasps the beast by the neck. Thus caught, the lion is comparatively helpless.



Model of Plane with Turbinelike Propellers at the Front and Rear; the One Behind Can Be Reversed and Used as a Brake

TURBINE PROPELLERS ON PLANE TO DEVELOP HIGH SPEED

Speed of 500 miles an hour is predicted with an airplane a California inventor is designing. It has turbinelike propellers at the front and rear, is to be fifty feet long and have a wing spread of sixty feet. The rear propeller, somewhat like that of a ship, is intended to serve as a stabilizer and, when reversed, as a brake.

TRACTION BAND FOR WHEEL HELPS CAR OUT OF RUTS

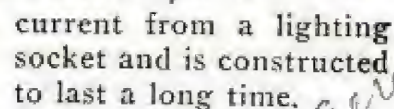


Tractor Band Partly in Place to Show How It Is Adjusted; Note the Cross-Pieces

Quickly attached to the rear wheel of the automobile, a canvas-and-rope band affords traction in getting out of a rut. The rope is threaded across the band at intervals of five inches to form effective grips and the whole is tied around the wheel. When not in use, the band can be rolled up and may be carried under a car seat.

H.A. Ayward, 1103 Grand St., Hoboken.

Karl Schapel
5035 Fair Ave. N.
Hollywood
Calif



2504

To signal the pilot when his plane is losing speed and is liable to go into a tailspin, an electric warning unit has been developed by a Canadian aviator. The apparatus is adjusted in such a way that, when the air speed decreases to the danger point, an electrical contact is made, and a buzzing sound is produced in the earphones worn by the pilot. The signal is given with a margin of safety so that the operator will have time to increase his speed before the spin. The attachment is considered especially

"Cribbage Board" Train Indicator, Used in Tower at Louisville, Ky., to Keep Track of Train and Engine Movements in Yards

helpful when the pilot's attention is likely to be occupied in picking out a landing spot, or in some other activity that may cause him to neglect the speed of the ship.

Keeping track of trains is a sort of game at a signal tower in Louisville, Ky. A unit somewhat resembling a cribbage board is used to indicate, by means of pegs, what blocks are occupied as the trains advance. The outfit is operated in connection with the manual block system.

SIMPLE GAUGE TO TEST SCREWS DETECTS FAULTY THREADS

Somewhat like a large flatiron in appearance, an electric unit for making meat tender has been introduced for restaurant and household use. It has a number of sharp fingers that pierce the meat so that the cooking will be done more thoroughly and the piece made easier to cut and chew. The tenderer operates with



For rapid and accurate inspection of screws as they come from the machine, a simple gauge now on the market easily indicates those that are defective, warns the operator before the tolerance limit is reached and provides a dependable tolerance zone by which the fit of the screw may be determined. The screw is simply inserted and turned into the gauge.



● The world's richest emerald mines are in the Ural mountains.

in the Ural mountains.
 Ernest Lamson Machine
 Co. Springfield, Vt

The Modern
10/26/48 *are*

2409 *Con. Clark*
Williams, P/5
951

7, Roseberry
Eng

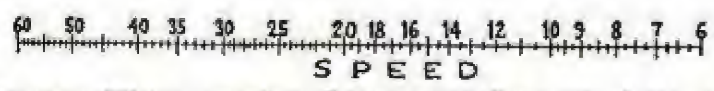
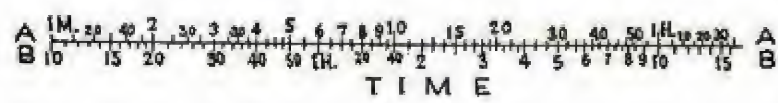
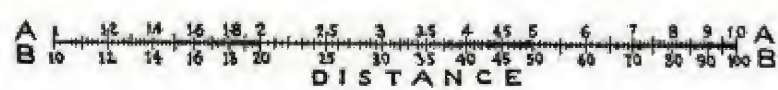
POPULAR MECHANICS

Van Ness Ave

Santa Ana Calif

RATE OF TRAVEL QUICKLY GIVEN BY SCALE

A simple chart to calculate speed from the time taken to travel a known distance has been developed by Ramon Zubiaga, of England. Three parallel scales are used, one calibrated for distance, with one to ten units on one side, and ten to 100 on the other; a second for time, laid out for one to ninety minutes above and from ten minutes to fifteen hours below; and the third for speed, calibrated from six to sixty miles. The chart can be used to calculate in any system of measuring, either miles or kilometers. To use it, a straightedge is placed on the figures corresponding to the distance traveled and the time it took to cover it. The ruler then shows, on the third scale, the rate in miles or kilometers per hour. For example, if a vehicle or boat covers seven miles in ten minutes, the ruler is placed on the seven in the distance column, ten in the time column, and rests on forty-two in the speed column. If distance is ten miles or less, use scales AA; if over ten, use BB.



Calculator Which Translates Distance and Time into Speed, by Placing a Straightedge across the Known Factors



Colors, Angles and Novel Use of Materials Are Evident in This Modern-Art Treatment of an Apartment-House Entrance

MODERN ART FOR APARTMENTS ADDS NOVELTY TO HALL

To create an impressive entrance to an apartment building in Los Angeles, an architect has resorted to elaborate use of the so-called "art moderne." Odd arrangements of angular designs and of different colors produce distinctive results.

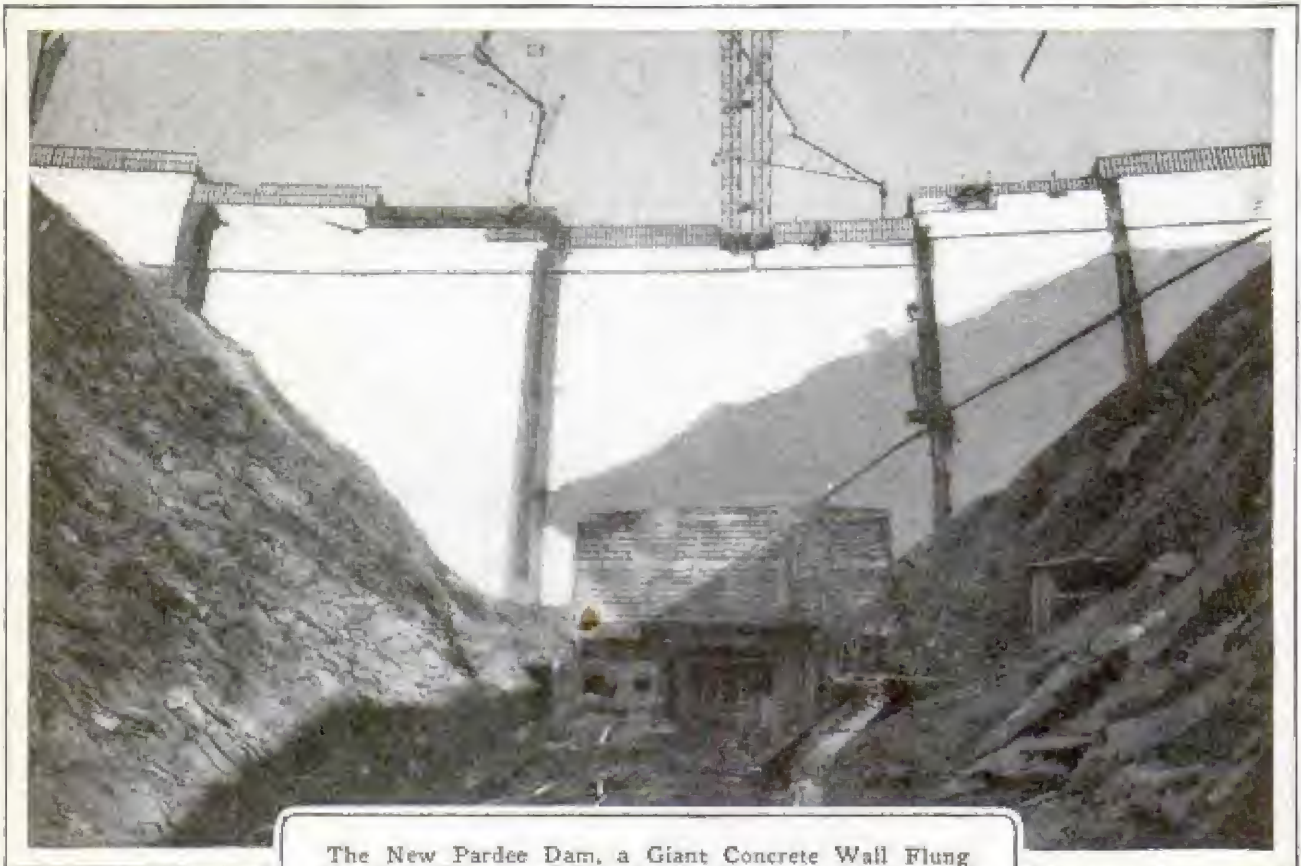
CONCRETE DYE RESISTS ACID AND FADING

For staining concrete, marble and various composition materials, an improved dye substance is said to penetrate to a considerable depth, does not deteriorate in the sun, and is not affected by various acids. It is intended as a substitute for paint.

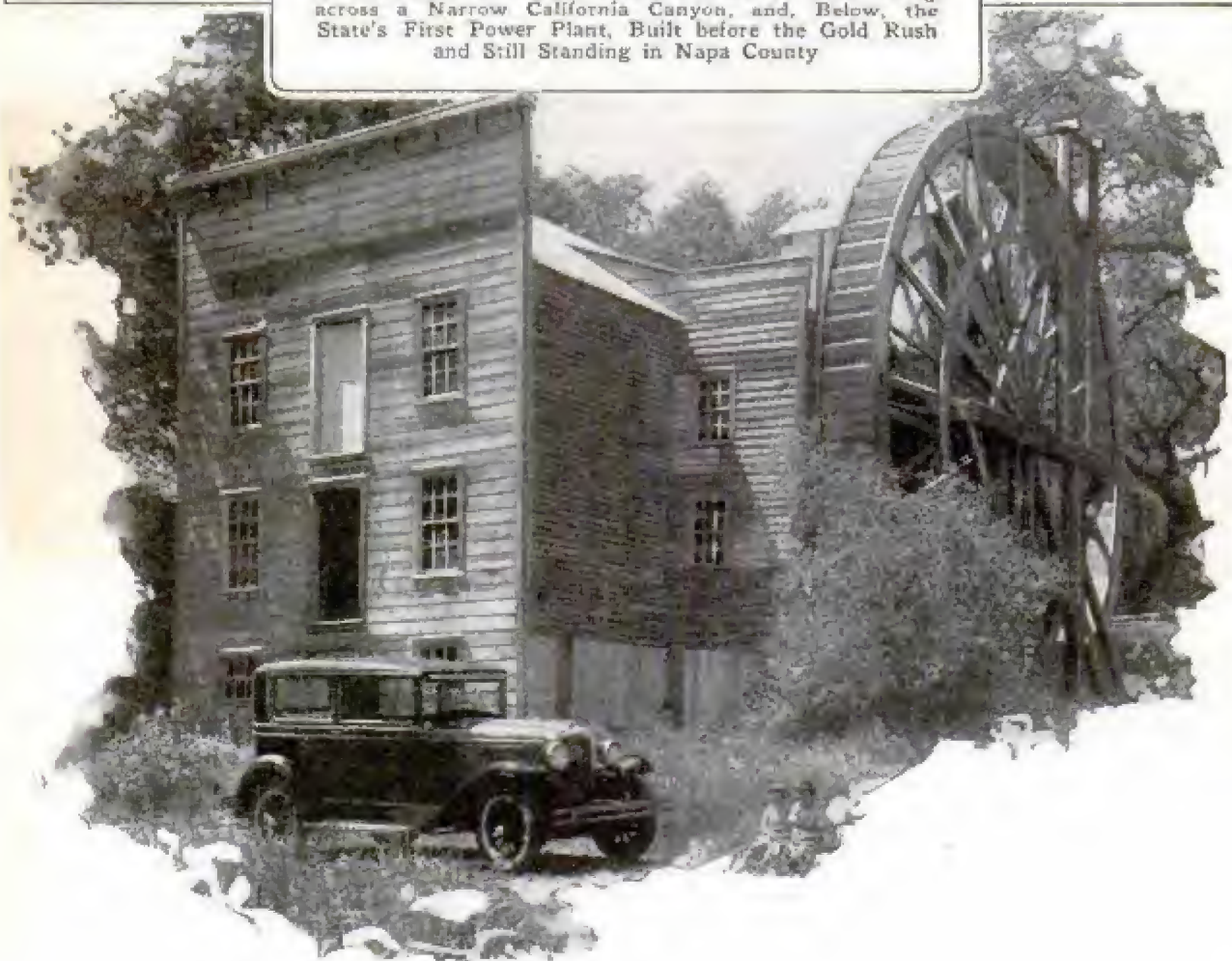
Chas. L. M. Kremer
2460 N. Clark

no further information

2143 *Copyright by Dr. C. C. Bates*
952 *an Englishman and holder*
of a Mexican land grant
POPULAR MECHANICS
FROM THE WATER WHEEL TO SUPER HYDRO POWER



The New Pardee Dam, a Giant Concrete Wall Flung across a Narrow California Canyon, and, Below, the State's First Power Plant, Built before the Gold Rush and Still Standing in Napa County



Euphorbia

POPULAR MECHANICS

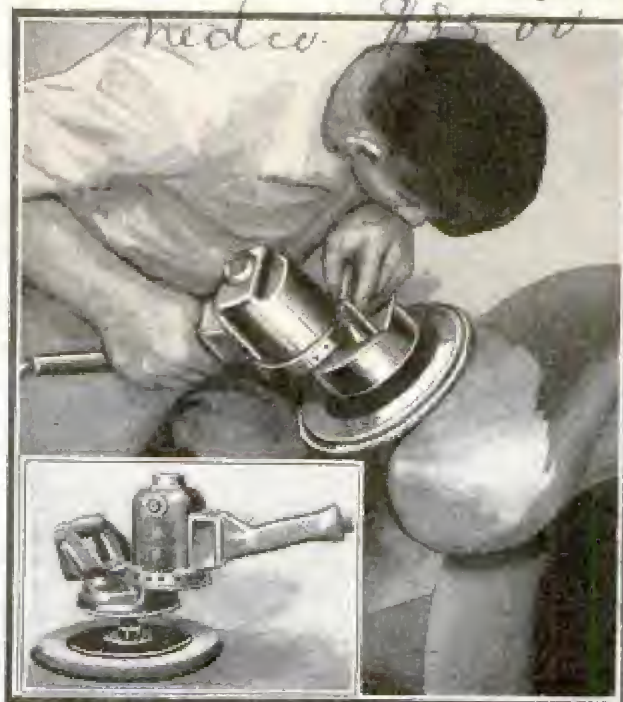
953

PLANT YIELDING MORE RUBBER FOUND IN MADAGASCAR

Scientists, and all who are concerned with the possible production of rubber in this country, are interested in a new species of rubber tree brought here by Dr. Charles F. Swingle, of the department of agriculture, from Madagascar. It is of a variety that has all but been exterminated and differs essentially from other kinds in that the rubber separates itself from the sap or latex on exposure to air. No coagulation or smoking processes are necessary as with the usual forms of rubber. The roots consist of chains of bulbous swellings, somewhat like sweet potatoes, and due to these tubers, which serve as water reservoirs during drouths, the plant is able to withstand desert weather. Experiments are to be made to determine if the species can be cultivated in the southern parts of the United States and in Mexico. It survives drouths, but whether it will stand light frosts remains to be seen. It is a slow-growing variety, so that years will be required before commercial production of rubber can be realized from it, even if the plant is found suited to climatic conditions here.

MOTOR SANDER AND POLISHER ALSO RUNS DRILL

Operated by current from a lighting socket, a portable sander and polisher that weighs but a few pounds, can also be used for running a drill. Attachments are provided for this as well as for buffers and brushes of different kinds. The unit is especially adapted to use on automobiles, boats, floors and the like. Grips give the operator an unusually convenient hold on the unit and control is in easy reach.



Buffer in Operation and Close View, Showing Grips and Method of Attaching the Polisher

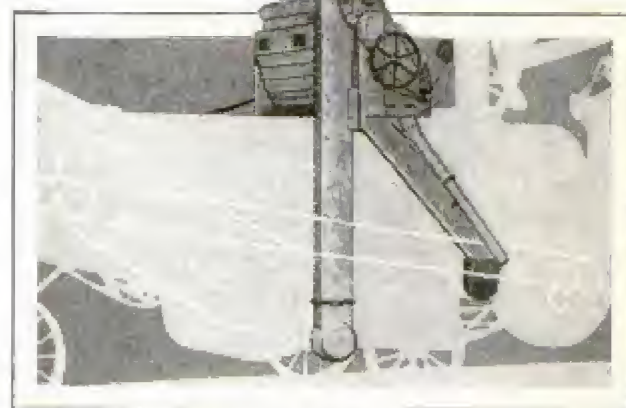
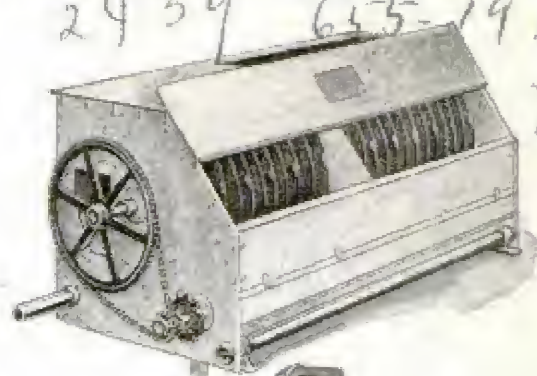
Cleaner Unit Detached, and Drawing to Show Its Relation to the Rest of the Threshing Machine

GRAIN CLEANER ON THRESHER —INCREASES FARM PROFIT

To give the grain a thorough cleaning as it comes from the thresher, a disk attachment is now on the market. It separates the dockage, which often constitutes a considerable percentage of the total crop. Unless this is saved at the farm and used for feed, it represents a loss, as the grower

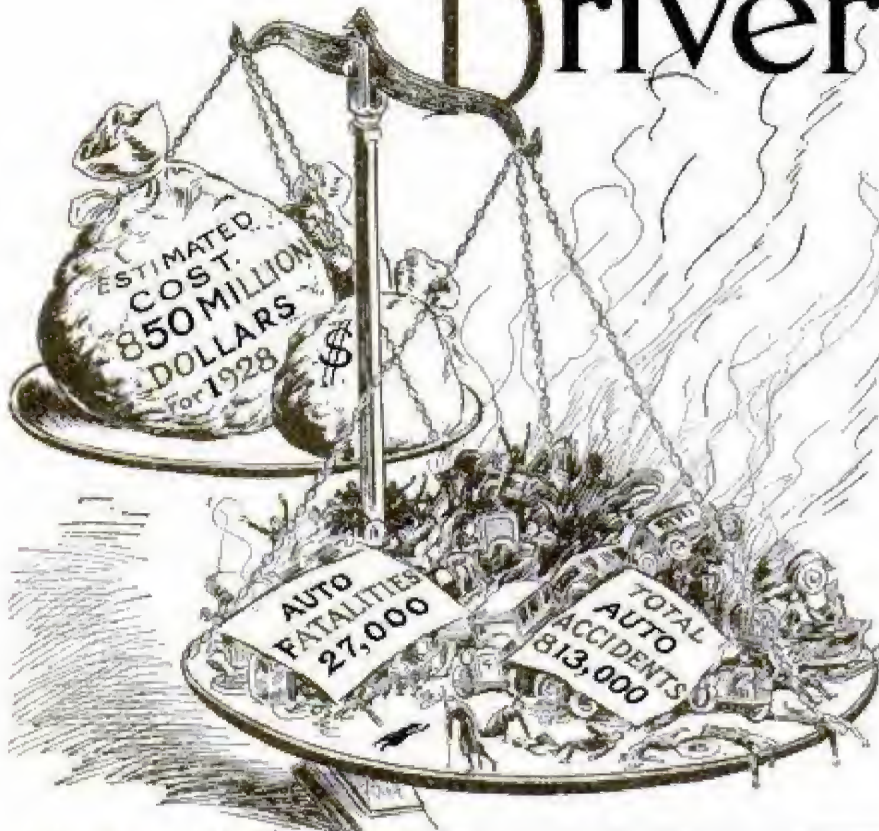
must pay freight on it with the grain, but it adds nothing to the price he will obtain for the crop. The unit has no screens or sieves, saves rehandling the grain and is easy to install and operate. It adds comparatively little to the total weight of the thresher and has proved popular with farmers who hire their threshing done by outsiders.

■ In 1819, the first steamship crossed the Atlantic ocean.



C. U. Warren & Co.,
Watch Co.

Drivers' Tests



tem of traffic signs, signals and markings. One reason for such a step is that, last year alone, 2,000 persons were killed because they became confused by signs with which they were unfamiliar. The increase in interstate travel by auto demands a uniform set of guides, the experts declare.

In the second place, there is, according to J. S. Baker, of the National Safety council, the human element. "It is not the breakdown of the automobile that is caus-

Wide World

THERE were 800,000 automobile accidents in the United States last year; 27,000 persons were killed and the loss involved was \$850,000,000, according to figures of the National Safety council. Fatalities were five per cent greater than in 1927.

Congestion caused by traffic in the motor-choked streets of our towns and cities, most of which were planned for buildings not over six stories high and for horses and buggies, is estimated to cost New York city \$540,000,000 a year, St. Louis \$16,000,000 and Detroit more than \$30,000,000.

What can be done about it? In the first place, a nation-wide movement is on to establish a uniform sys-



Cartoon by the National Safety Council, Showing the Automobile-Accident Situation, and, Below, Inspector W. Black, of Detroit, Cautioning a Driver Just Licensed; above the Blackboard Are Signs Applicants Must Identify at Sixty Feet during Tests



Efficient Handling of Automobile Traffic Is Essential to Safety; These Candidates for Special Positions in the Berlin Police Department Are Studying Routing Problems with Aid of Scale Models

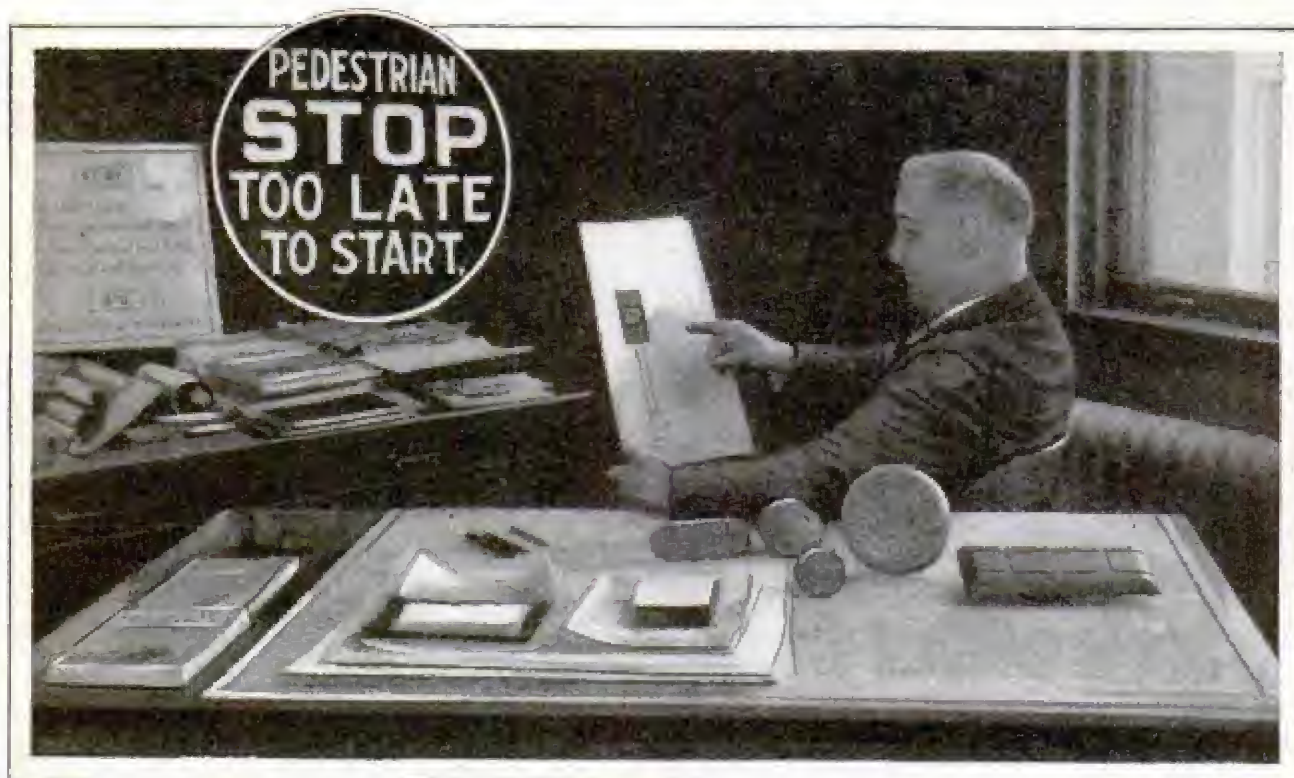
ing accidents," he says, "it is the breakdown of the driver." The breakdown has also been traced to the pedestrian, for in thousands of cases, he and not the motorist is to blame for the mishap. Consequently, some cities are passing strict regulations against "jay walking," pedestrians are being routed in definite traffic lanes while on the sidewalks, in order that there may be less confusion there and less danger in crossing the streets, and a nation-wide drive is being conducted among school children to teach them care and thoughtfulness in order that accident may be avoided.

Already, results of these movements are on record. Washington, D. C., with a population of nearly 600,000, went through last December without a single motor fatality. Detroit suffered seventy-four fewer automobile deaths in 1928 than in 1927, although the population increased by 45,000 and the number of automobiles by 90,000. The year was marked by a twenty-per-cent decrease in automobile fatalities.

The effects of the Detroit educational campaign were particularly noticeable

among the school children. In the first nine months of last year, fatalities among children between the ages of five and fourteen were nearly thirty-four per cent less than in the same period in 1927. Old persons showed a similar good record. Fatal accidents by automobiles to those over fifty-five years old were reduced more than twenty-seven per cent. The smallest improvement was noticed in the group from sixteen to fifty-four years of age, the span of greatest activity and, often, of greatest carelessness. The reduction was less than eight per cent in this last division. More than half of the accidents in the entire city involved persons between the ages of twenty-five and fifty-four, although that group comprises considerably less than half of the population.

Michigan and several other states require that every driver of an automobile obtain a license before he can operate a car. Every state having such a law, has had encouraging results from it. On the basis of the records of these states, properly administered drivers' license laws would result in a twenty-per-cent reduc-



William L. Potts, of Detroit's Traffic-Survey Department, Examining Drawing of Proposed Neon-Gas Sign to Warn Pedestrians Not to Cross; Sign in Use and Sidewalk Line Guides Shown on Desk and Upper Left

tion in motor-vehicle fatalities throughout the country, according to Sidney J. Williams, of the National Safety council. As applied in Detroit, the law is typical of the state of Michigan and of other states. Step into the police headquarters building where the licenses are applied for and watch it in operation.

Applicants of all classes, both men and women, must fill out the necessary papers and then answer a number of questions concerning traffic regulations. They are required to pass hearing and sight tests, including the identification of colors and various street-traffic signals and signs. After filling out the blanks and obtaining a notary's seal, the prospective driver passes to an examiner. Questions, picked at random from the police book of regulations, are put to him by an examiner. He must read the traffic signs and distinguish the colors on cards hung on the wall about sixty feet away. These posters are exact duplicates of the street signs. The examination often reveals serious eye defects, inability to tell colors and other difficulties that need correction before his application is approved.

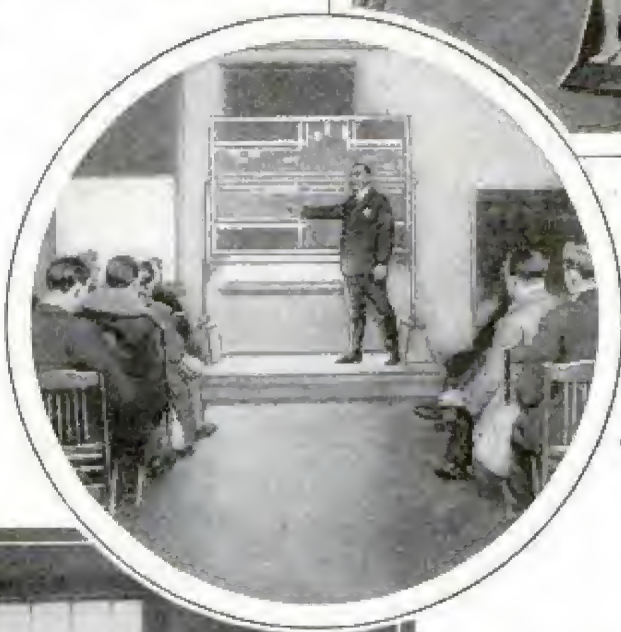
Step upstairs, and you see what happens to those who fail in the verbal examination of the traffic rules. They are sent to school, which is held at noon daily except

Sunday and three nights each week. By means of a blackboard diagram, Sergt. J. Wesley Brown is explaining why it is unwise and unsafe to attempt to pass another car at an intersection, and is demonstrating other features of the regulations. Since the school was started about five years ago, he has taught more than 200,000 pupils who failed at the application tests. Usually, one or two sessions at the school enable the candidates to pass the verbal examination at the next trial. Applicants under eighteen years of age, and those having some physical defect, are required to take an actual road test under the eyes of a competent examiner.

The training school has revealed a number of interesting facts. During the first ten months of its operation, careful records were kept of the performance of "graduates." Chauffeurs of light and heavy trucks, for instance, who had attended the sessions, were involved in fewer accidents. In fact, there was a marked decrease in the number of fatalities and other accidents by automobile trucks as a result of the school, while there was an increase in the accident totals among operators of passenger vehicles who did not take the special schooling. The work of instruction is extended by the bureau of

public safety, of which the drivers' school is but one department, to the organization of safety patrols in both public and parochial schools, reaching the parents through evening meetings at the schools, distributing safety literature and giving motion-picture and other educational displays. School janitors have been enlisted in the street-patrol work. Police caps were ordered for them, and they took pride in the task. Pupils picked for patrol duties must maintain a certain scholarship level, and, in many cases, the opportunity to be a patrol guard proves an incentive to a youth who has been backward in his school work.

While these educational programs are going forward among drivers and school pupils, a traffic-survey bureau is laboring to find the causes of automobile congestion and danger in the streets and at



intersections. To warn the motorists of safety zones, officials introduced them to "Lady Godiva," a rubber model clothed in black and white and decorated with glass ornaments to reflect the headlights of automobiles. The "lady" was placed

at the entrance to the safety zone and kept in an upright position by flexible bracings. Most drivers steered out, warned by the figure that they had reached a safety zone. Those who did strike Lady Godiva were relieved to discover that they had not maimed or killed anyone, for the rubber model promptly bobbed up when the car had passed. A glaring skull and crossbones in neon-gas lights is another effective warning that is being tested at safety zones, and a rubber stop sign, also decorated with glass jewels and set upright in the pavement, where it will be plainly visible and will fly back again should it be run over, is also being used. Last year, in Detroit, 160 vehicles hit protected safety zones,



"Lady Godiva," Detroit's Safety-Zone Guardian; Sergeant J. Wesley Brown Giving a Traffic Lesson, and a Safety School in Session at Indianapolis



Candidates for Automobile Driver's License Lined Up at the Bureau in Detroit's Police Headquarters Building; on the Wall at the Rear Are Traffic Signs That Must Be Identified during Examination

killing six persons and injuring 208. At the unprotected zones, ten persons were killed and 268 injured. The unprotected, occupied safety zones were entered by 229 vehicles.

Recognizing that control of pedestrian traffic in crowded areas would greatly aid the general situation, officials of the survey bureau established sidewalk lanes at a busy down-town block. These helped in keeping persons to the right and were of great benefit, not only in decreasing con-

fusion on the sidewalk, but in keeping order at the street intersections, where people commonly jostle and crowd each other, losing precious seconds. A helpful device for the pedestrian is now under preparation in the form of a neon-gas stop sign that will warn him that it is too late for him to cross the street. This is expected to be of great aid, for pedestrians, unaware that the danger light is about to flash against them, commonly find themselves stranded in the center of the street.

MUSIC IS PLAYED BY ALPHABET AS SUBSTITUTE FOR NOTES

Little skill is required in playing a new musical instrument introduced in a west-

ern city. It has a disk plate, lettered with characters of the alphabet. By turning the disk to the letter desired and blowing, the player produces the right note.

SEVENTY-FIVE MILLION SPENT IN AMERICA FOR PLANES

Last year, the United States spent \$75,000,000 for airplanes, according to a report of the aeronautical chamber of commerce. Production of commercial aircraft in 1928 was 140 per cent greater than the year before, 5,000 airplanes being built and sold and 3,500 aircraft motors marketed. Wichita, Kans., is the center of the airplane-manufacturing industry with 927 planes built in 1928, seventy more than were constructed in New York city, which ranked second. Rapid extension of air passenger routes and the opening of joint air-rail lines indicate the advance of commercial aviation in this country.



Playing the New Musical Instrument by Alphabet

242
Mr. Playstone Co
113 South Broadway
New York City

243

Retail - Weigelt Bros

Herald Examiner
5/1/29

Science Service Bulletin
416 20.

Donner Hall
Huber
959
93 Federal

**NEW STYLES IN BATTLESHIPS
 SET BY GERMANS**

Smaller, faster battleships and cruisers, armed with twelve-inch guns, the favorite caliber of pre-war days, may replace some of the huge floating fortresses, such as the "Nelson" and the "Maryland" with their batteries of sixteen-inch guns, if the style represented by the new German "surprise" ships is followed. These vessels have a speed of twenty-six knots, sufficient to run away from any battleship now built, big enough to sink them, except for four big cruisers in the British navy and four in the Japanese. Other nations have plenty of cruisers fast enough to overtake the new German ships, but they are armed with eleven-inch guns. Naval authorities are wondering if a medium-sized battle cruiser, of about 17,500 tons and armed with twelve-inch guns, would not be advisable. There were boats of this general description in the British navy before and during the war, but they were scrapped in accordance with the Washington treaty. One chief advantage of the smaller guns is that they can be fired much more rapidly than the big ones and, although a single projectile from the twelve-inch guns is less effective than one from a sixteen-inch, the greater number, fired in a given time, would cause as much, if not more, damage in the opinion of experts.

**HOTEL STATIONERY-DISPENSER
 REDUCES WASTE**



At the turn of a small wheel, writing paper and envelopes are dispensed from an attractive metal holder for the hotel desk. This saves time and keeps the paper from becoming lost, mused and soiled. The holder has space for advertising legends.

☐The Popular Mechanics' Bureau of Information offers its free service to all readers of this magazine. Names and addresses of manufacturers and dealers in article described, and any other details in our possession, will be promptly furnished.

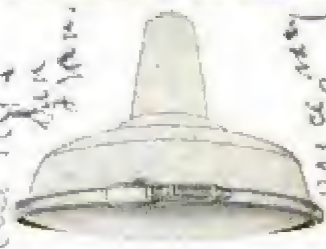


**TOY-BALLOON PUNCHING BAG
 HELD BY VACUUM CUP**

Anchored by a rubber vacuum cup which may be attached firmly to almost any smooth surface, a small rubber balloon, when inflated, becomes an effective punching bag. It affords healthful exercise as well as amusement, requires no rigging of any kind, and can be put up or taken down in a few seconds.

**DUST-TIGHT REFLECTOR COVER
 SIMPLIFIES CLEANING LAMP**

Easily attached, a clear-glass disk cover fits over the electric-light reflector to keep out dust. To clean the fixture, all that is necessary is to wipe off the outside of the glass, thus renewing the maximum light output. The disk is firmly held in position and also keeps particles from flying upon the hot bulb, a dangerous factor in some plants.



Sander, Mfg. Co.
123 7th Ave. S.

Langman
Benjamin
Co. 120



Water Tower, at Nassau, in the Bahamas; on the Top Will Be Installed Powerful Lights to Guide Aviators

WATER TOWER TO GUIDE FLYERS BY REVOLVING LIGHTS

Air liners in the Pan-American service will be guided by brilliant revolving lights on top of a water tower, 210 feet above sea level, at Nassau, in the Bahamas. The crest of the tower is reached by an elevator and affords a wide view.

GLASS HOUSE KEEPS OUT DUST AND DISEASE GERMS

A Japanese scientist has constructed an all-glass house which is said to be air, dust and bacteria-proof. It is built of glass blocks, cellular in form and consisting of a number of thin plate-glass rectangles held together by iron frames. There are no windows. The air passes out through a number of small ventilators along the ceiling of the second story but cannot flow into the building through them. Fresh air is pumped into the house through a pipe line from a far-distant point and is filtered to exclude all impuri-

ties. Sunlight and heat penetrate the walls freely from all sides. Some of the blocks are filled with a heat-absorbing salt solution so that the rooms are cooler than they would be if protected by awnings and shades. In the evening, when the temperature falls, the heat absorbed during the daytime is given off and keeps the house comfortable in the night. A few hours of sunshine in a day suffices to keep the interior comfortable for twenty-four hours.

CLOCK THAT WON'T RUN ONE OF EDISON'S SUCCESSSES

One of the most interesting of Thomas A. Edison's inventions is a clock that never ticked a second or turned a wheel, and yet it is one of his many successes. It now stands on the mantelpiece of his laboratory building, which has been moved to Dearborn, Mich., from Ft. Myers, Fla., for Henry Ford's American Museum. It stood there when Edison was performing some of his most important experiments and was using the clock, too, although it had never registered an hour. The clock face is simply the cross-section cut from a small log and is without numerals or hands. The pendulum that hangs but never moves, ends in a bob similar to the face, but smaller. Rings on the face and the pendulum are prominent and suggest the true function of the clock, which was to remind the workers that they were not to be regulated by hours or minutes but by results. Time, in the usual sense, meant little to Edison and his co-experimenters. The measure of a day's work was its results. The clock's case is of American walnut, and it has an etched glass front.

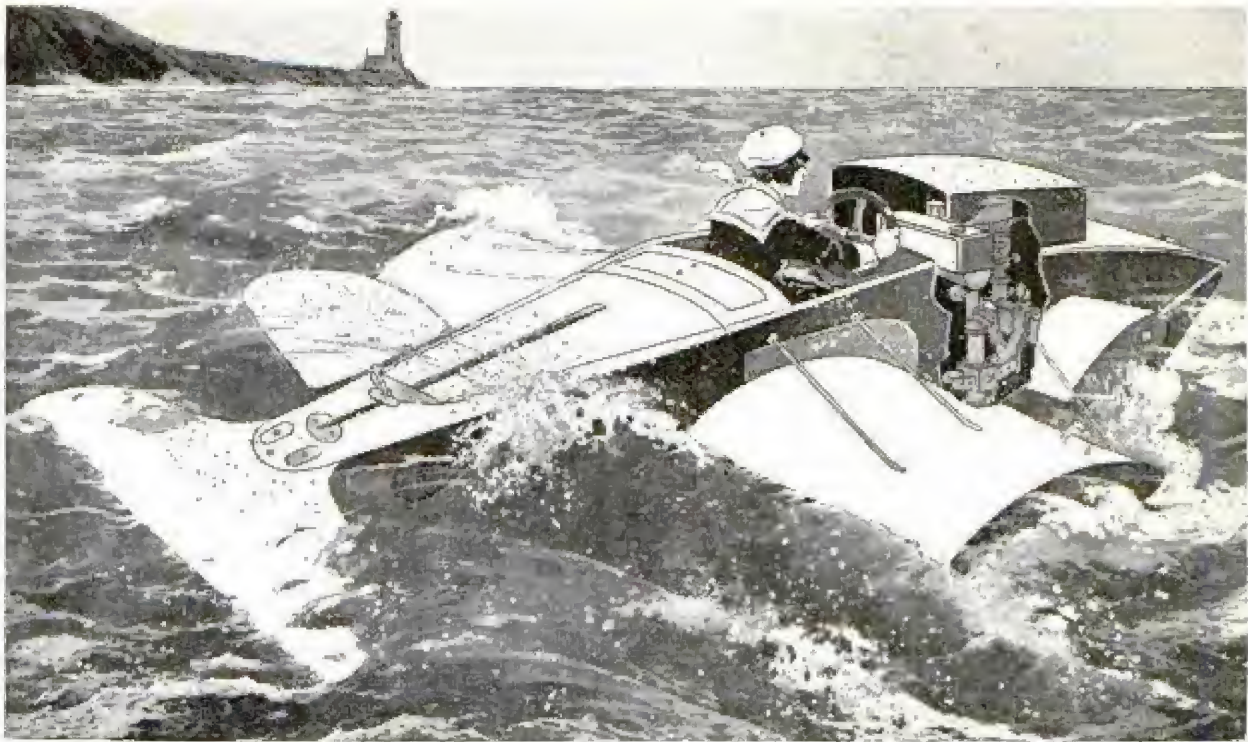


American Walnut.

116 1/2 in. 616

116 1/2 in. 616

in. instrument 116 1/2, 2/2/129



Drawing of the Plane-Shaped Motorboat, Showing the Arrangement of the Wing Floats and the Engine; Note the Air Rudder Just Forward of the Tail

STEEL OUTBOARD MOTORBOAT BUILT LIKE SEAPLANE

Several novel features have been introduced in a steel outboard motorboat recently constructed by an English inventor. It is designed after a seaplane with streamlined hull, an air rudder and floats that resemble the wings of a plane. The exhaust is carried to a silencer under the boat, from which, through the propeller-shaft boss, the gases are shot into the spray. The special use of the air rudder is in the nature of an experiment when the motorboat is running through a heavy spray from which the engine is protected by a cowl. The engine is installed in the bow. When the boat is operated at high speed, the air rudder goes out of action and steering is done with the water rudder.

POWDER INSIDE ELECTRIC LIGHT REMOVES BLACK DEPOSIT

By placing a tablespoonful of coarse tungsten powder inside the electric-light bulb before it is sealed, engineers have found a way to remove the black "soot" that is deposited on the interior of an incandescent bulb. When the lamp so treated becomes blackened, it is simply

removed, inverted and the deposit is swept from the glass by the powder. The method prolongs the life of the bulb.

BAR CUTTER FOR RESCUE SQUAD HELPS SAVE LIVES

For rescuing persons who may be trapped in burning structures, the Washington fire department has been equipped with a huge cutter to sever bolts and bars. It is essentially a pair of shears with handles for applying powerful leverage.



© U. & U.

For Speedy Rescue Work; These Powerful Cutters Sever Steel Bars in a Few Seconds

Lamp cleared in Laboratory
and used in Lamp itself.
General Electric Co. 1916

2348

Soup



A "Mother Ship" for Turtles, with Derrick to Lift the Huge Creatures Aboard, and a Sliding Door to Discharge Them into the Ponds

By H. H. DUNN

park bl. idy lagoon
WHEN nature built the turtle, she provided man with meat, kettle in which to cook it, bowl in which to serve it, fat for the cooking, plates for the serving, and spoons and forks for the eating. She even furnished the package for the shipping of the meat; all that remained for man to do was catch the turtle. He is pictured, usually, making this capture by dexterously flipping a 400-pound, land-wandering sea turtle to its back on a moonlit sand bar in some tropical lagoon.

Even, however, if the turtle would hold its flipper outside its shell long enough to be flipped on its back, there are few men since Goliath who could do the flipping, and by far the greater part of the more

than half a million dollars' worth of turtle meat which came into the United States last year was taken in flimsy seines, by daring men who risked their lives every time a "tortuga" hit the net. Even whaling holds few greater risks than the taking of green sea turtles, though modern mechanical equipment has reduced the danger, just as it has in whaling.

The remote ancestor of the sea turtle, eight to twelve feet long and standing four feet high, armored from head to tail and from backbone to belly, took a nip at the dinosaur, defied the saber-toothed tiger, and chortled in his carapace at whatever monsters roamed the prehistoric seas in which he wandered. The descendant of this antediluvian turtle retains armor and defiance of every living thing except man, with the result that sea turtles are increasing in numbers in all parts of the world, and maintaining themselves as the basis of an unusual industry.

When man goes after the turtle, he starts from San Diego, Galveston, New Orleans, Mobile, Tampa, Key West, or even up as far as Baltimore, on the Atlantic coast. Turtles are caught in all tropical and semitropical seas, but American methods of taking them are most productive. Each turtle hunter has his own fleet of half a dozen boats, and his crew of eight or ten men. First of all, there

from the Sea



Hundreds of Huge Turtles, Weighing from One to Four Hundred Pounds, Are Kept in the Cannery Ponds Waiting to Be Turned into Steaks and Soups When Needed

is the "mother ship," fifty to one hundred feet long, driven by gasoline or oil engines, and equipped with tanks occupying most of her hold or her deck space. Pumps, driven from the propelling engine, keep salt water from overside constantly circulating in these tanks, and a cargo mast, boom and winch are provided to handle the turtles into and out of the great boxes of sea water.

On deck of such a "turtler" are carried six to eight skiffs, provided with oars, water tanks and food supplies for two men each for a week or more. Running with or towed behind the main vessel, are two motorboats, twenty to thirty feet long, equipped with one seine to each boat.

These nets, 1,000 to 1,200 feet long, 100 feet wide, rimmed at frequent intervals along the top with large cork floats, and weighted at the bottom with sheet-lead rolled around the rope binder, are known as "lamparas," "parmentas," or "retiaras," the latter almost a complete retention of the name given the net used by gladiators in the ancient Roman arenas. Each one of the motorboats has a towing post for attachment of lines from the skiffs.

So equipped, and with provisions for the crew and fuel for the engines for a month's run, sometimes more, the turtler starts south, into the Mexican waters of the Pacific, the Gulf, or to the Caribbean sea on the Atlantic side. Two or three

hundred miles south of his American port, a lookout is posted to watch for turtles asleep on the ocean. Usually, these "floaters" are solitary, but if more than two are seen together, the fishing starts. The mother ship drops over a sea anchor, made of canvas, in shape like a huge umbrella or an exaggerated mushroom, to hold her steady in one place. One of the motorboats takes two or three of the skiffs in tow and proceeds to the rear of the turtles. There one of the skiffs, carrying a free end of the long net, is loosed, and, with the seine running from her stern, the motorist swings in a wide circle, around the sleeping turtles, and back to the skiff, whose end of the lampara is taken inboard on the larger boat, and the "drove" of turtles inclosed, with the skiffs also inside the circle of the seine.

If the turtles waken, they charge the seine. Weighing from one hundred to four hundred pounds, and with great power in their flat flippers, these tortugas will cut through any ordinary net, but this net is woven of half-inch oiled rope, with large meshes, so that the turtle, even though it become entangled, may not

choke itself to death, for the dead turtle is useless. Like the sea lion, to have any value in the market, it must be taken, and kept, alive.

The skiffs move backward, slowly and silently down on the sleeping turtles, a man with a heavy noose of rope in one hand leaning out of the stern, and the other rowing from the forward half of the boat. Reaching the turtle, the noose is passed quickly and dexterously around the shell just forward of the hind flippers. This is the craftiest part of turtle catching, for if the noose slips the turtle may escape; if the creature feels the touch of the rope before it tightens, it may turn in the water and take with it the hand of the fisherman, or it may seek the deep water from which it cannot be lifted.

If the turtle escapes the noose, but remains on the surface, the fisherman plunges after it, seizes the shell just forward of the front flippers, so close to the head that the turtle cannot bite, and hangs on with a bulldog grip. The weight of its body prevents the turtle from diving and slows the latter's speed so that instead of crashing through the seine, it



Huge Green Sea Turtles, Being Lifted from a Net into the Fishermen's Dory in a Pacific-Coast Lagoon on the Lower California Coast, 500 Miles below San Diego



The Turtle's Last Ride; Once on Its Back, the Most Powerful of These Deep-Sea Dwellers Cannot Move; Each Turtle Is Worth About Fifty Dollars "on the Shell"

merely becomes entangled in it. About two out of five turtles are caught in this manner, at great danger to the fisherman, because if the turtle does dive, the fisherman must let go immediately, to avoid drowning in the downward rush, and at the same time get his hands so quickly away from the shell that the powerful "beak" cannot reach out and seize him.

Turtles entangled in the seine are hauled inboard with it, if not too heavy; otherwise, a rope is passed around them. Once brought to the skiff, the turtle is skidded inboard, on its back, and left lying in that position, so that it cannot turn over. There is constant danger from the sharp, beaklike jaws of these chelonians, and many a turtler walks with a limp as a remembrance of a cut on ankle or leg clear to the bone. Once at grips with the enemy, the turtle holds on until the jaws are pried open with an iron bar or the head is cut off. If a hand is seized, the head is withdrawn within the shell, and the member slowly chewed off, a process of considerable unpleasantness to the fisherman.

During the actual taking of the great green turtles, the men in the skiffs lead active lives; indeed, the fabled mice on a

hot griddle could have been little less active. When the drove of turtles is captured, the skiffs are picked up, with their seine, by the motorboat, and towed back to the mother ship, where the turtles are hoisted in, turned right side up and dropped into the tanks. One might think that the skiffs could be eliminated and the fishing done directly from the motorboat, but long experience has taught that, when a 300 to 400-pound turtle is taken, the small boat can be tipped up by the weight of both men in the stern, or dipped on either beam by their weight, so that the lift becomes a matter of only a few inches, instead of two or three feet, as it would be with the larger craft.

Though a few turtles are taken on the deep sea, often fifty miles or more from land, the center of the industry on the Pacific is in the comparatively shallow lagoons where the sea turtles congregate at certain seasons of the year. These are numerous on the western coast of Lower California, and all the way down both sides of Mexico, Central America and South America to points hundreds of miles below the equator. In these lagoons the nets are spread on stakes at nightfall, and the turtles picked up in the morning.



No Ordinary Net Will Hold a Turtle, So the Boats Follow the Rim of the Seine Closely to Lift the "Tortugas" Inboard Before They Decide to Make a Dash for Freedom

A few are taken on the sandy shores, after they have laid their eggs, but this is slow work, with few turtles for a night's labor.

When the mother ship is filled with live turtles, she turns back to the American port from which she came. There the catch is placed in large, shallow tidal ponds, so fenced in that the waters of the sea may flow in and out. Thousands of turtles are so stored for months at a time, one set of ponds at San Diego alone containing more than 5,000 of them at once. From the ponds, the turtles are lifted on cranes to wooden trays, traveling on cable "railways" to the cannery platforms, whence they are slipped, on their durable backs, down long troughs to the cleaning tables and cooking vats, to appear at the other door of the packing plant in the form of steaks and soup.

The tropical coastal dweller, however, goes to no such trouble to get his green-turtle soup. He merely catches his turtle at the shoreside, cuts off its head and flippers, dresses the meat, and cooks it in its own broth by the simple expedient of raising the shell on four stones, and building a fire underneath. Once cooked, he eats it from a plate made of a piece of the shell of another turtle, with a fork and a spoon carved from the same shell. No fat or water is added in the cooking, and the result is a dish never equaled in flavor by

the prepared product of the American turtlers' long voyages.

MYSTERY OF WEATHER CHANGES REVIVED BY COLD WINTER

Scientists are discussing anew several theories in regard to the weather, as a result of the recent cold winter in various parts of the world. One supposition is that these periods of arctic intensity are likely to recur in a definite cycle at intervals of slightly more than thirty-three or thirty-five years. In England, for instance, there was a cold spell in 1826, 1860, 1895 and again this year. Another theory is that the cold and hot periods are the result of the solar cycles and sunstorms at definite times. The various ice ages that have occurred in the past history of the earth are thought to have resulted from the wandering position of the poles or the eccentricity of the earth's path around the sun. The shifting of the poles, somewhat like the wobbling of a top as it spins, is the result of a gyroscopic force and is believed to account for the presence in temperate parts of the earth, of red soil usually found in hot desert places. The red earth and the coal beds, made of tropical vegetation, suggest that areas in North America and Europe may once have occupied the latitude of the

Conk U. Alkins

present Sahara desert. Opposing this view is the theory that in the course of ages, there has been a slow sliding of the outer skin of the earth and a consequent shifting of the continents.

SINGS WHILE DRIVING AUTO TO RELIEVE EARS

After taking long drives in an automobile, an eastern physician was bothered by an uncomfortable feeling in his ears. He attributed this to the constant noise of the motor and found a way to avoid the trouble by singing while driving. He points out that the exercise is beneficial to the lungs, helps posture and promotes circulation, thereby relieving congestion that may form in the ears, a condition that induces the discomfort after a long drive.

BOLT THAT LOCKS ITSELF RESISTS VIBRATION

For use in many fields of industry, a patented self-locking bolt, now on the market, eliminates the need of lock washers, cotter pins and other devices, as it is so constructed that the nut cannot be loosened by vibration, according to reports. This is accomplished by the special design of the threads. The nut is screwed on in the usual way and can be removed with less difficulty than the usual type, it is said. The bolt is intended for special service on airplanes and other vehicles where shock and vibration are important factors.



HEIGHT OF KITCHEN SINK

To tell if the kitchen sink is at the proper height, the housewife stands before it and places her palms on the bottom. If she can do so without stooping, the sink is properly adjusted. The one-piece enameled sink, with a high back and two drainboards, has proved satisfactory in the majority of kitchens, according to a survey by the University of Nebraska.

CULVERTS WITH FLAT BOTTOMS REDUCE RAIL HAZARDS

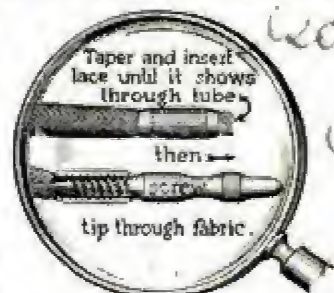


Installing Flat-Bottomed Culverts That May Be Used for Cattle Walks under Railroad

Flat-bottomed concrete culverts that serve both as water carriers and as cattle passes are being installed by the Chicago, Milwaukee, St. Paul and Pacific railroad. They eliminate the hazardous method of driving cattle across the tracks, are not difficult to place and are substantially built for long life.

LOCK TIPS FOR SHOELACES PROLONG THEIR LIFE

Adjustable screw tips for shoelaces that are not likely to be pulled off when once properly attached, have been introduced to lengthen the life of the laces and to prevent the bother of ragged, frayed ends. The lace is simply inserted through the base of the tip and then the top part is screwed on. It penetrates the lace and binds it against the base so that it is not easily pulled out.



Wardell Threadlock Corp 120 Broadway N.Y.

End Earle Shuff The Rembridge 1406 Chicago Ave Evanston, Ill

Universal Locking Co Boston 168 Marlborough Ave

Agricultural College
Lincoln Nebraska

WORKERS' SAFETY FACE MASK GUARDS EYES AND MOUTH



Face Mask Raised over the Goggles; It Can Be Lowered Quickly to Protect the Wearer

Goggles and face protector are combined in a safety mask which shields the worker from strong lights and from flying fragments as well. The goggles may be removed, if desired, and the gauze mask, which is usually worn out of the way at the top, may be pulled down over the face.

MOON HAS NO EFFECT ON CROPS WEATHER BUREAU SHOWS

One of the most persistent superstitions about the weather, government scientists have found, is the false belief that the moon has some effect on crops, and that better or less favorable results will be obtained if planting and other operations are performed at certain times when the moon is in a particular phase. According to legends, if the horns of the new crescent moon tip downward, it is a "wet" moon, indicating rain. The weather bureau points out that, on any given date, the position of the crescent moon is always the same in places having the same latitude. If the sign were a reliable one, the same kind of weather would prevail throughout

a belt of latitude extending around the world. This is not the fact, as any investigation will quickly show. Again, the proverbs say that when the young moon is in a horizontal position, dry weather is coming. The absurdity of this is easily seen near the equator, a part of the world notorious for its rainfall and where the new moon is generally in a nearly horizontal position. If the moon could be seen from the north or south pole, its position, to the superstitious, would indicate wet weather, but these regions have so little rain or snow that they are classed among the most arid in the entire world. The chief things affecting the growth of crops are temperature of the soil and air, composition of the adjacent atmosphere, kind and intensity of light, presence or absence of disease, and soil conditions. The moon has nothing to do with any of these factors, the weather bureau declares.

STEEL CULVERTS AS PIERS SAID BRIDGE BUILDERS

Steel culverts filled with concrete were successfully employed as bridge piers for an electric-railway viaduct over lowlands in Kansas. The finished work cost no more than concrete piers made with wooden forms, considering the expense of building and removing the forms, and the culverts made a neat trestle besides saving time in construction.



Culverts Filled with Concrete and in Place for the Bridge Piers; Their Use Proved Economical

Con. Stanley Russell
Winfield, Kans

Exhibiting in Berlin.

2469

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Plane Fitted with Ice and Snow Skis That Do Not Have to Be Removed for Landing on Dry Ground; the Wheels Extend through the Skis, Leaving Ample Space for Rolling

SKI FEET FOR AIRPLANES LAND ON GROUND OR SNOW

Fitted over the landing wheels, special skis have been introduced for airplanes so that the craft can descend on bare ground or on ice or snow. The landing-gear wheels project through the ski frames, permitting them to turn and support the plane just as though the skis were not attached.

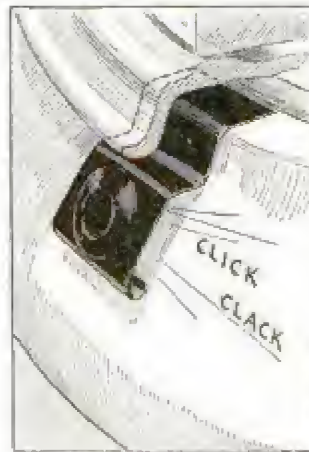
RICH MINES OF MONTEZUMA STILL YIELD TREASURE

Mines that were worked by slaves in Mexico, to fill the tribute lists of Montezuma before the discovery of America, are still yielding wealth and are more important than any recent discoveries of metal deposits, according to a report of the Mexican chamber of mines. The early miners tapped the richest veins. Ventilation of the shafts was an unsolved problem, illumination was accomplished by oil lights or tallow candles, and the ore was carried out on the human back. When the richest mines were exhausted, they were deserted. Modern mining science has enabled the worker of today to gather

fortunes from the old sites, not by finding new ore deposits but by working the comparatively low-grade ores at a profit.

CLICKS TELL MOTORIST WHEN TIRES NEED AIR

To warn the driver when his tires need inflating, a metal ticker has been introduced. It operates on the same principle as the toy noise makers that produce a loud sound when they are bent and straightened. The metal piece is inserted under the rim and extends down over the outside of the casing. When the tire becomes deflated and sags to the danger point, the bulge causes the signal to give a loud clicking sound with each revolution of the wheel.



Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information.

2471
Co 31321 Market
Wichita, Kans
See info on page

Kansas City Star

3/4/29

Philip Rouzevelles & The Clacker Co, Portsmouth, N.H.
head Sellers ret'd.

Entered in Patent, 1906. N. H. Rouzevelles
Washington, D.C.



Washington School Girls Studying Their Target after Discharging a Flight of Arrows; Archery Is Becoming More and More Popular among Both Sexes in the Larger Cities

"WHY, the feat's impossible! There's some trick to it."

Such were typical comments of scores of Boston archery enthusiasts not so long ago as they watched Dr. Saxton Pope, nationally known archer of California, shooting seven arrows, one after the other, into the air before the first could hit the ground. He had accomplished something that had been deemed beyond the power of man, had indeed rivaled the legendary skill of Hiawatha, who was said to have delivered his tenth arrow before the first descended.

But there was nothing magical about Doctor Pope's unique feat. It just happened that he was scientist enough to study carefully the problem and, after so doing, had built a dozen light arrows having wide "nocks" (tips of the arrow where the wood is grooved for the bowstring) and with rear ends flattened so they might be fingered readily. Next he devised a way to grasp a supply of ready shafts in the bow hand and invented an arrow release in which all the fingers and thumbs could hold the arrow on the string while remaining entirely on the right side of it.

Equally novel and revolutionary have been certain other of Doctor Pope's arch-

ery tests. Indeed, he is one of a trio of prominent Americans who have been spending their spare moments hoping to develop a "mechanical archer" that, by entirely eliminating the errors involved by the personal equation, may ultimately go far toward helping solve many of the perplexing problems that always have confronted the wielder of the bow and arrow. The other men in this trio are Dr. Robert P. Elmer of Wayne, Pa., one-time champion archer of the United States, and Dr. C. N. Hickman, research physicist.

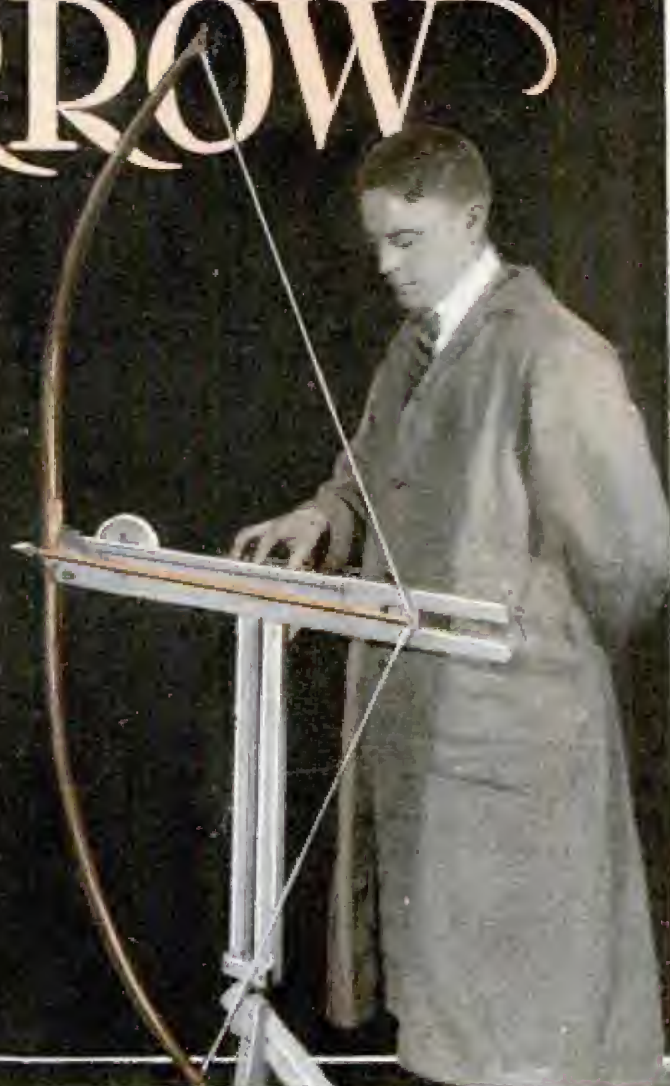
Recently Doctor Pope explained that he wanted to know the answer to the question: "How would an arrow fly if the bow were held in a mechanical rest and the string released mechanically?" After months of experiment, he succeeded in building a mechanical archer. Using the same arrow each time, with the target set at sixty yards, he found that the arrow tended usually to fly to the left. And when he tested nine different arrows he found that five consistently flew exceedingly near the same mark, whereas four went far afield. Doctor Pope's conclusions were that, while it might be possible to select arrows that would act in a fairly uniform way, yet it was obvious enough

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Dr. C. N. Hickman, Research Physicist, Testing a Bow in a Mechanical Archer Designed by Himself

that any good archer could manage to group the hits considerably closer than the machine could deliver them. Doctor Elmer likewise turned inventor and constructed a stand of four large timbers to which he bolted a bow and arranged for the string a mechanical catch with a trigger. He also experienced that strange tendency of the arrow to swerve to the

left that had perplexed Doctor Pope. Every archery enthusiast is familiar with this tendency, and it is known as the "archer's paradox" for the very good reason that, at first glance, the almost inevitable swerving habit seems to be absurdly impossible, but upon careful investigation proves to be undeniable.

As an archer and inventor, Doctor Hickman felt the greatest interest in the Pope-Elmer tests and decided to devise a mechanical archer of his own. But before so doing, he endeavored to apply some reasoning like this: As the human archer holds the bow in his hand, pulls the string back and releases it, the string moves in a path straight toward the center of the bow, and its second position, when it comes to rest, is still directly back of that central point.



What has happened? As every archer knows, all arrows have little nicks on the tips, or nocks, as the correct term has it, which prevent the arrow from jumping off the string before the proper shot is achieved. Now, as the string moves from position two, this nock is carried along with it. The result is that the arrow has been pulled around so that it now is pointing farther to the left than it was originally.

Bearing these theories in mind, Doctor Hickman began designing his mechanical archer, taking care to try to remedy what he regarded as defects in the Pope-Elmer devices. Summed up, these might be defined as existing because the two men had been unable to approximate closely enough the archery maneuvers of the human arm. When the Hickman device was finally developed, the bow was mounted in the end of a light wooden member made the same length as the average man's arm and pivoted in a fashion that was almost uncannily human.

In his very first test Doctor Hickman demonstrated that as many as twenty-two shots could land in the bull's-eye of the

regulation target, which is four feet in diameter. These results also explained the behavior of the arrows as employed in the Pope apparatus. For instance, why did certain of them swerve to the left to about the same degree, whereas others went far afield? The answer is, Doctor Hickman concludes, that, as the arrow passes over the bow, it receives initially a high velocity in a direction straight toward the target. But as the string comes nearer the bow, the feathered end of the arrow is pointed to the right, with the almost inevitable result that the arrow either has to bend or else its front end kicks quickly around to the left. Since naturally a very stiff arrow won't bend readily, it will tend to go much farther to the left than will the very limber kind.

But even with its revolutionary advantages as an arrow-testing machine, the Hickman archer was unable to stay away from the archer's paradox, though, to be sure, the tendency of the arrow to shoot to the left was far less pronounced. So Doctor Hickman concluded that he had not yet been able to simulate hand shooting to the degree he had hoped



Courtesy The Archer's Company
Archery Golf, at Top; A Hunter's Bow-and-Arrow
Bag, Center; Workman Setting a Bow at Pinehurst



Group of Washington Girls Ready to Let Loose the First Flight at the Target; Ninety Arrows Are Usually Fired by Each Contestant, with a Possible Score of 810 Points

for. He once more concentrated his attention on just how the bowstring is released and noticed that, during the process, the string invariably hits the arm, a fact so well-known that, to offset it, the archer commonly wears an arm guard.

Next he figured out that if the string were able to travel straight toward the center of the bow it would never touch the arm. Indeed, the only way the string can move to the left is by the rotation of the bow in the hand or at the wrist, or by actually somehow deforming the string so that its ends are not in the same shooting plane with the nock of the arrow. In the latter case, a great deal of force necessarily would have to be expended.

This entire situation is really very simple and may be verified readily by all archers, Doctor Hickman says. They need merely grip the bow tightly and give it a clockwise tension once the string has been pulled back, and they will discover that the arrow will tend to go farther to the right than if they held the bow loosely. On the other hand, if they give it a counterclockwise motion, the arrow will tend to travel somewhat to the left.

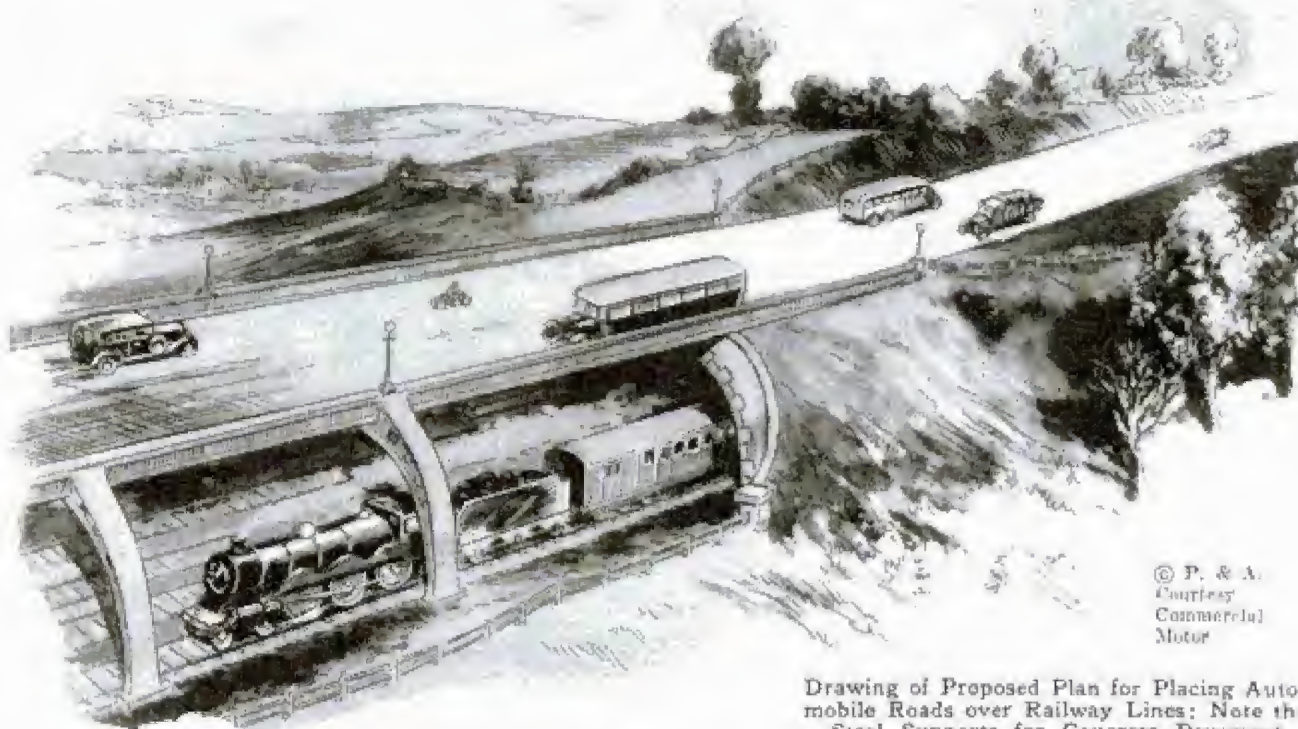
Now, many archers, without knowing just why, hold the bow loosely in the hand. This is highly commendable. Doctor Hickman says, for his tests have convinced him

that this procedure permits the bow to rotate freely and thereby reduces the tendency of the arrow to fly to the left. The fact is, he points out, that those who grip the bow tightly must exert greater control of the arm muscles than those who grip it loosely.

Arguing this way, it became evident to Doctor Hickman that if some means could be devised whereby the bow could be gripped in an absolutely uniform and efficient manner, then an archery difficulty that has existed for centuries might be almost altogether eliminated—our familiar friend, the archer's paradox.

Right now, it would seem that Doctor Hickman has been successful in this respect. He has invented a new and simple kind of handle that can be attached to a bow in a few seconds. Made of brass tube, a couple of inches wide, the handle permits the archer to grip the bow as tightly as he wants to, while offering the uniformity of hold described above. That it has proved its worth, may be found in the fact that, when used only a few times, it thus far has increased the inventor's score twenty-five per cent, according to his own statement.

¶ Giant bullfrogs in South Africa weigh about ten pounds.



© P. & A.
Courtesy
Commercial
Motor

Drawing of Proposed Plan for Placing Automobile Roads over Railway Lines; Note the Steel Supports for Concrete Pavement

AUTO ROADS OVER RAILWAYS TO RELIEVE CONGESTION

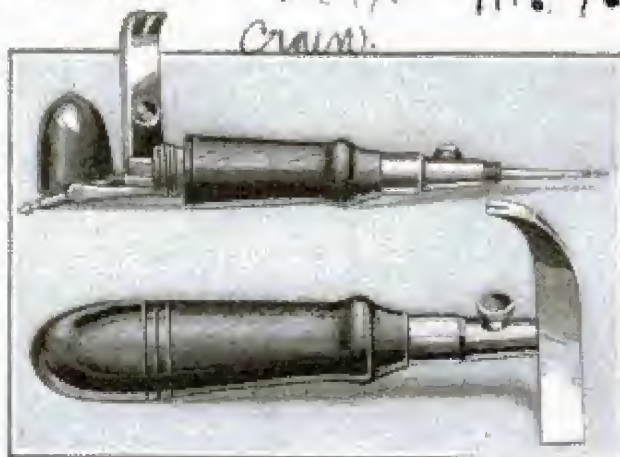
Engineers have suggested a series of automobile roads to be constructed over railway lines entering London. They would be laid on cross girders and a foundation of concrete over the tracks, and would lead from the crowded city centers to points where they could be joined to existing highways.

TAPE UNDER SEA MEASURES DISTANCE TO AZORES

To measure the distance sailed by the cable steamer "Dominia" between Bay Roberts, Newfoundland, and Horta, in the Azores, a tape-line in the form of a slender piano wire, was payed out as the ship proceeded. The distance was 1,264 miles, just seventy-seven miles less than the previous calculations of the cable engineers.

The method was expensive, but was the best that could be devised and was employed for the reason that any greater length would have seriously upset the estimates made by the engineers in designing the cable for the transmission of messages at a certain speed. The steel wire gave the distance traveled by the ship and the irregularities on the floor of the sea were indicated by accurate charts for every mile of the way; hence, the cable men were able to judge the amount of slack required for the entire line.

TOOL KIT IN HAMMER HANDLE AIDS HOUSEWORKERS



Hammer and a Few of the Tools in Its Handle

The head of a hammer now on the market unscrews, revealing a chuck and a number of tools carried in the handle. They are held in the chuck by a setscrew, and the entire outfit is useful in performing a number of household and shop tasks.

and Mrs. C. C. Callahan / Kansas City
3415 New College Ave.
2547
210

Dist. George Borgfeldt & Co.
1118 1st St. New York
Crown
Crown Cutlery Co. Germany

Marshall Field & Co.
Household Appliances Dept. Chicago

INDEX TO LEFT-HANDEDNESS FOUND IN HAIR

After a close study of several sets of identical twins, two eastern scientists have observed that there is an apparent relation between the tendency to left-handedness and the direction in which whorls in the hair curve. In every case where it was possible to determine whether the hair on the crown of the head grows in a right-handed, or clockwise, spiral, it was discovered that the person had a more or less strongly developed tendency to right-handedness. If the whorl was curved to the left, the person was left-handed. Examination of the twins showed that they were more likely to be both right-handed or both left-handed rather than one left-handed and the other right-handed. In an identical set, the right side of one was more closely matched by the right side of its twin than by its own left side.

SHOES THAT "BREATHE" TO STOP FOOT TROUBLES

Greater health and comfort are expected from shoes that have a special system of ventilation. As the wearer walks, air is drawn in and forced out through holes at the toe. Various foot ailments are expected to be prevented by these shoes.



Blowing Smoke through the Openings in the Shoe to Show How Well the Article Is Ventilated



Pilot with Carrier Pigeon Taken on Flights as a Possible Rescuer in Case of Forced Landing

PIGEONS CARRIED IN AIRPLANE TO AID FLYERS

To help him in case he should be forced down on a flight, a western aviator takes a pigeon with him on his journeys. The bird would be released, should necessity demand, and fly home with information as to the pilot's location, written on a paper slip in the small tube the pigeon carries.

GUN AS SUBSTITUTE FOR DRILL DRIVES PIN THROUGH METAL

Explosives are being used in various ways for peace-time purposes, and one of the most interesting is the adaptation of a special gun to fire steel pins and other parts through metal plates as a substitute for drilling. In a recent test, a spiral-fluted pin was fired through a plate about three-fourths of an inch thick. When the pin was backed out, the hole was found perfectly grooved, and the engineers declared that a straight or tapered pin could have been shot through with equal success. The surface of the metal in the hole was smooth, as if burnished, and should withstand long wear.

J. K. Hamilton
439 Russell Blvd } Los Angeles



Water Golf on the Swimming Pool Provides Amusement for Players and Spectators; the Hole Is a Floating Ring and the Caddy Has an Extra Job as Boatman

GOLF GAME PLAYED ON POND — LATEST WATER SPORT

Water golf has appeared at a California resort and is reported to be popular among those seeking novelty and a thrill. The holes are represented by rings that float on the surface. The caddy holds the bag as usual, but is also the oarsman to ferry the player around the course in a small boat. Considerable skill is required in making shots and in keeping balance.

COATED MATCHES AND CIGARETS TO REDUCE FIRE HAZARD

Discarded matches, cigaret and cigar stubs cause a fire loss of some \$90,000,000 a year, according to the national board of fire underwriters, and interesting tests have been conducted at the bureau of standards in an effort to reduce this destruction by making matches and cigarettes that will go out more quickly when they are thrown away. Use of a cork tip an

inch long, either plain or coated on the inside with water glass, proved effective, as the butt naturally ceased to burn much more quickly than that of the ordinary cigaret. Asbestos paper, a double thickness of cigaret paper and boric-acid solution also were effective in decreasing the hazard of the stub. It is estimated that approximately 170,000 cigaret stubs are discarded every minute. In 1927, more than 30,000 fires are believed to have been caused by smokers in public and private forests of the country. More than 7,000,000 acres were burned with a loss of over \$6,000,000. Attacking the match problem in the same way, the investigators found that the water-glass coating, applied to all but one-half inch next to the head, greatly reduced the possibilities of ignition from the discarded stick. Statistics show that nearly 550,000 matches are used in the United States every minute. The fire hazard from them is greater than from the cigaret, as the match usually falls with a live flame instead of a glow.

Science Service Bulletin

417 A 3/18/19

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FLATIRON IS EASIER TO PUSH WHEN CHROMIUM-PLATED

Here is good news for the housewife. Engineers have discovered that by plating the bottom of the electric flatiron with chromium, thirty per cent less energy is required to push it across the ironing surface. Figuring this in terms of the number of these special irons to be manufactured in 1929, there will be a saving of 20,800,000,000 foot-pounds of energy by the American housewives during the year. This is six times the amount required to drive the steamship "Leviathan."

DEATH'S HEAD IN RED LIGHTS WARNS CARELESS DRIVERS

To urge motorists to drive carefully, a skull-and-crossbones sign glows in red on some of the safety zones in Detroit streets. The sign is intended to be of special service in preventing drivers from crashing into the posts that guard the zones where passengers board street cars. They are of glass tubes filled with neon gas and can be seen at a great distance. The device is understood by everyone whether he can read the word "danger" or not.



Neon-Gas Sign at Entrance to Safety Zone in Detroit to Warn Autoists to Turn Out



Entire Inner Tube Depressed under Rack in Water for Puncture Testing

PRESS FOR INNER-TUBE TESTS HELPS LOCATE PUNCTURES

Testing an inner tube for leaks by immersing it in water, is a reliable method but limited in efficiency because the whole tube cannot be submerged at one time and by the fact that bubbles which are not caused by leaks also are formed. To simplify and improve the process, a simple testing outfit, recently introduced, eliminates these troubles. The entire tube can be submerged and held under water by means of a press rack that fits over the tube. A lever arrangement enables the operator to force it down with little effort, and hold it in this position by a locking device. The operation is done smoothly and without disturbing the water, so that bubbles other than those from a leak are not likely to appear.

LANGUAGE FOR ALL NATIONS HAS FIVE HUNDRED WORDS

Scientists and scholars at Cambridge university have developed a new international language. It contains just 500 words and can be printed on a single sheet of note paper. English is the basic tongue chosen, and it is said that persons of any nation may learn the reduced vocabulary in a few weeks or months. It is called "panoptic English."

My Co. V. J. Pedrante U.S. Army

235 13728's Park Blvd
San Diego, Calif

Capturing



A Sea-Lion Pup, Fresh from the Ocean, but So Tame When Captured That It Enjoys Being Petted; It Takes Less Than a Month to Train Such a Tame One for the Stage

THE SEAL on the end caught the ball, set it spinning by a rotating motion of his doglike head and passed it to the one in the middle. But the sleek, black 500-pound fellow merely rooted it further up into the air, caught two more balls from his master and kept all three dancing on his snout as the curtain fell to applause equal to that of the star at the head of the night's program. For the trained seal today is the greatest and most popular performer in the world.

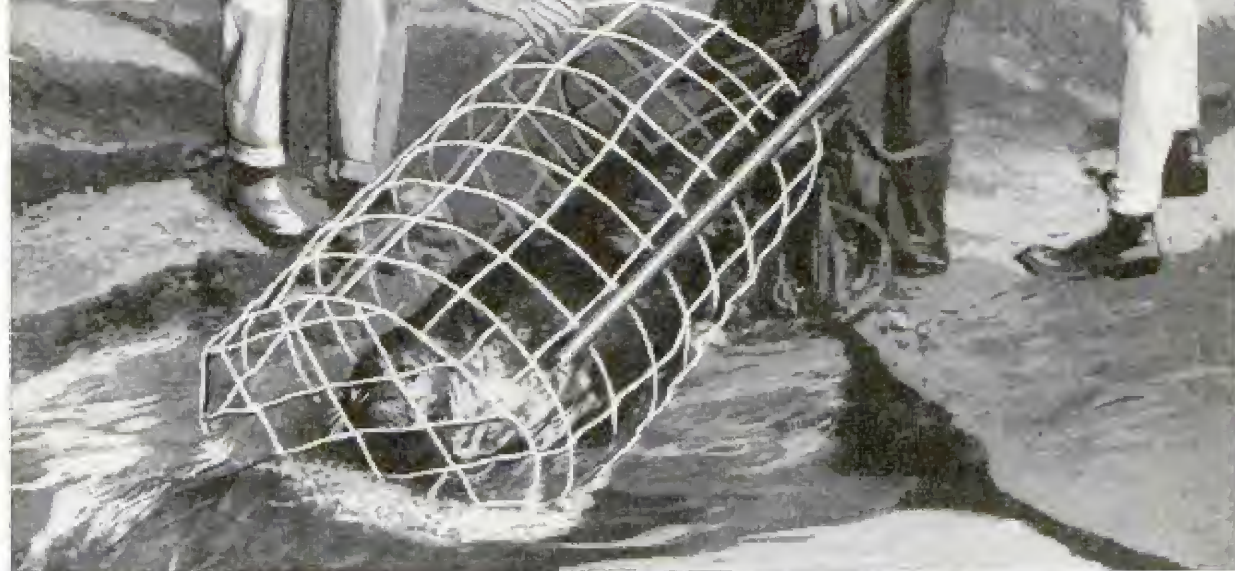
This popularity is attested by the fact that there is a market all the year round for about 600 untrained but tractable seals, and that the supply is never equal to the demand. Be it known, too, that the trained seal is not a seal at all, but a sea lion, once more accurately known as sea dog, whose fur is worthless as furs go, but whose capacity for domestication and receptivity to teaching is even greater than that of the

dog. Inability to move freely and gracefully on land alone prevents the sea lion from becoming a common pet.

A thoroughly trained seal is worth from \$2,000 to \$5,000, depending, as an old showman said to the writer, "on the degree of its intelligence." An untrained sea lion, especially one which has accepted captivity with good grace, is worth from \$500 to \$750. Not more than six weeks is required to train the slowest-witted of sea lions; usually a month is enough to put the animal on the stage, well equipped to do his, or her, share in the program.

But where does the trained seal come from? He is not "born on the stage," as some of our human stars claim to have been. He is not even reared from puppyhood behind the footlights, because pup sea lions rarely live to maturity in captivity. There are no sea lion "ranches," as there are lion "farms," prepared to sup-

Trained Seals



After Being Caught in a Net, the Sea Lion Is Worked into a Wire Cage, to Be Carried to the Hunters' Boat; There Is a Strictly Enforced Law against Killing the Animals

ply trained seals on order, and, so far, no one has established a school for these affectionate, docile, intelligent mammals of the sea. Indeed, every sea lion now on the stage, anywhere in the world, was once wild and free; most of them, as a matter of fact, swimming around three barren islands off the coast of Mexico, known as the Coronados, some fifteen or twenty miles south of the California boundary.

These islets, inhabited only by introduced goats, domestic goats which have gone wild, and sea birds, are the source of by far the greater number of all the sea lions in the zoological gardens and circuses, or on the stages of the world today. The rocky slopes and ledges of the Coronados are filled at the proper season with pup sea lions, friendly little fellows, no larger than a foxterrier, easily caught, but valueless because, if taken from their mothers, they would not live. Oddly enough, these puppies cannot swim and apparently never would learn except that their mothers teach them, with much effort and great patience. Until they have learned to swim, these puppies may be picked up, patted and played with by anyone who visits their rookery, and who is wise

enough in sea-lion ways to keep a sharp watch for the mother of the particular pup being handled.

But after the young sea lion learns to swim, when he has reached a weight of 100 pounds or more, then he, or his sister, is "ready for the market." But neither of them can be picked up then, or petted, except in those unexplained instances in which a wild sea lion, either half or full-grown, accepts man willingly as his friend. Among sea-lion hunters, such instances are many. There have been cases in which the animal, after allowing the hunter to stroke and feed it, followed him to the beach, was lifted into a boat, and so carried away to captivity without protest. Other sea lions, of the same age, size and herd, prove entirely untractable and must be returned to the sea or placed in the pools of a zoo. The old bulls, each the head of a harem, are in this class, and attempting to capture one of them is like trying to handle 1,000 pounds of dynamite at the instant it explodes.

The older cows, too, are untamable, fight furiously to protect their puppies, and form the snarling rear guard when the herd leaves the rookery at the approach



After the Hunters Get the Sea Lion into the Wire Crate, Carrying Poles Are Inserted through the Meshes

of men. The young cows, however, are more intelligent than their brothers, and command higher prices for the stage, though the bulls are the more beautiful for zoological gardens and traveling shows. Victor Goularte, skipper of a tuna-fishing boat out of San Diego, lifted an eighty-pound sea lion, which had been eating sardines thrown overboard in "chumming" for tuna, to the deck of his craft, by the simple method of leaning over the rail, seizing the young bull by the tail and heaving him inboard. This seal, placed in one of the bait tanks for a few hours, became so friendly that it was released and given the freedom of the after deck, where it stayed until the vessel returned to San Diego, where the animal was turned over to the zoo.

But the catching of sea lions for stage and exhibition purposes is one of the world's unusual industries, which has reached its greatest development on the Coronados, from which, and from the mainland coast of the Mexican state of Lower California, are taken annually some 450 of these animals. So prosperous has the industry become that modern mechan-

ical aid has been called in, and the catch this year will be proportionately increased, without even approaching what is known in other industries as the "saturation point."

The older and simpler method, by which virtually all the trained seals you have seen on the stage were captured, required six to eight men, and a sea lion a day was a large catch. The hunters, traveling in a large schooner or motorboat provided with individual cages for the animals and with ample space on the stern to place the cages so that their occupants could not reach each other, voyaged from San Diego to the inland, or eastern, side of the larger of the Coronados. Here they anchored the larger

vessel and transferred themselves into a skiff, approaching the rookery with the utmost quietness, usually at midday, so as not to arouse the herds. This movement had to be made at full high tide.

Landed at one side of a rookery, the hunters lay heavy seines, made of half-inch rope, with lead weights at bottom and cork floats at the top, across the mouth of any one of a number of small but deep inlets, running back into caverns in the rocks. These inlets and caves fill with water at high tide, and the younger sea lions swim back into them, apparently in search of certain shellfish which open when covered with sea water. As the tide recedes, the lions follow it back to the Pacific. To aid them in getting out of the caverns, the water is beaten with long poles in the hands of two of the hunters. The sea lions, thinking the splashing is caused by a school of fish trapped in the inlet, rush out.

Meanwhile, two or three men, on each end of the seine, which is fifty to sixty feet long, hold it across the inlet. If eight or ten sea lions come out together, the net usually is torn from the hands of the



The First Step Is to Stretch the Heavy Net across a Narrow Estuary in the Rocks at the Rookery Just as the Tide Begins to Drop, Then the Lions Are Scared into It

hunters, who are fortunate if they escape being pulled over the rocks and out into the 200 to 400 feet of water which surrounds the island on all sides. If two or three of the animals come out first, they pull down the upper side of the seine, and raise the lower edge, so that the sea lions following them pass over and under the struggling mass of captives, and so escape to the sea. The hunters prefer one sea lion at a time.

Great care has to be exercised that the animals do not drown themselves while in the seine, or fall to fighting each other, in which case the long and sharp teeth, like those of a dog, inflict wounds that usually are death to the animal receiving them. The state governments of California and of Lower California maintain strict laws against the killing of sea lions, and the penalty for violation is severe. Some sea lions submit almost immediately to the net and are transferred easily to the oval carrying cages, made of heavy wire, but the greater number fight until they lose hope of freedom.

Once transferred from the seine to the cage, long and stout poles are passed lengthwise through the meshes, and the

animal is carried to the skiff, which takes it at once to the larger vessel where fish and plentiful dousings with salt water await the captive. Six sea lions, safely on board the schooner or motorboat, is a good week's catch by this method, and as a rule all so caught are delivered safely to the zoological society's ponds in San Diego, whence they are distributed, through exchange and sales, to other zoos, circuses and to owners of troupes of trained seals.

By the more modern method, which is having its first trial this year, boats carrying tanks large enough to contain ten or twelve sea lions, with a separate compartment for each animal, are being used. Electrically driven pumps bring salt water in quantity from overside, circulate it gently through these tanks and return it to the sea, giving the sea lions as near natural conditions as possible for their stay on board ship. Other tanks will contain quantities of live sardines and squids, also kept in circulating salt water, so that the fresh food to which the valuable bulls and cows are accustomed may be given them.

Each of these boats is equipped with a heavy mast and electrically operated boom



A Few of the Many Thousands of Lions That Play about the Coronado Islands; the Young Pups Cannot Swim, but Have to Be Taught That Art by Their Mothers

with a lifting capacity of five tons. A specially designed seine, to be handled by this boom, will be spread over the stern, and trailed through the swimming herd of sea lions, frightened from the rookery at the proper moment by men firing blank cartridges from the hills above. While such a ship could pick up ten or more sea lions of large size at one hauling of the seine, no attempt will be made to do so, because of the danger to the captured animals. Two or three, at most, will be the limit, if the operators of the seine boom are able to pick their sea lions out of the water as they believe they can. The advantage will come in the ability to cruise around the islands until ten or more sea lions have been taken, resulting in a cargo worth \$5,000 or more delivered in San Diego. Further advantage lies in surety of delivering all animals caught in good condition.

These boats are completely equipped with electric auxiliaries for refrigeration, lighting, radio, pumps, anchor winches, cargo hoist and even cooking. Propelling power is a heavy oil engine of 300 or more

horsepower, giving them speeds of eleven to twelve miles an hour, and enabling them to come into San Diego from the Coronados in less than two hours.

THREADS ON SIDE OF WOOD BIT 2214 HELP BORE HOLES



Less pressure need be applied, smoother holes are made and greater ease is experienced in cutting through knots and tough wood with a bit that has threads on the sides of the cutting blades, according to reports. The arrangement also helps prevent breaking the bits, enables the oper-

ator to bore on straighter lines and works without splintering the wood.

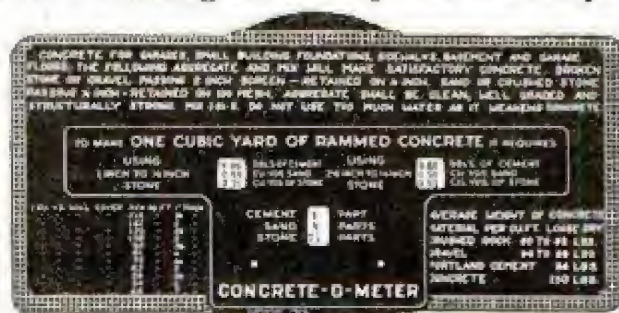
*L. Palmer.
806 Maple Ave.*

RADIUM IS FIREMAN
IN RUBBER PLANT.

Radium has been adapted to snuff out dangerous sparks of static electricity and so prevent fires in a Russian rubber factory. Only a small quantity of radium is required, and the method costs but a few dollars per year. When the rubber solution is flowed upon a fabric base, and dries, enormous charges of static electricity are produced from the friction of the rubber-covered material against parts of the drying machinery. In time, the pressure of the accumulated charges becomes so great that a hot spark is caused. This has been counteracted by leading the electricity away with a fine wire brush, but a small quantity of radium has proved more effective. Placed near the point where the electricity is generated, it ionizes the air in such a way that the dangerous charges of electricity flow harmlessly through it to the nearest metallic part and thence to the earth.

METER FOR MIXING CONCRETE HELPS REDUCE WASTE

How much aggregate and cement are required for making a cubic yard of rammed concrete is indicated on a simple meter, devised by an employe of a western company. It consists of a rotating disk with numbers that show through slots, to tell the quantities of the different materials that are needed. It shows what amounts of cement, sand and stone to use, even with stone of various sizes.



Concrete-Mixing Meter, Showing the Indicators, on Sides and in Middle. That Tell Proportions to Use

ICE BOX FREEZES CORN IN FIELD TO IMPROVE CROPS

How much cold will corn stand and what varieties of corn are best to plant where there is a likelihood of frosts? These and other interesting questions relating to better and bigger crops are answered with the aid of a portable electric refrigerator that is wheeled directly over the growing corn plants in the field and freezes them or exposes them to low temperatures while careful records are made. Temperatures are accurately controlled throughout the entire test, and the experiment can be done at different periods during the development of the corn so

that the effect of a frost would be indicated at any stage. The tests have shown that some varieties of corn successfully withstand twenty-eight degrees Fahrenheit while others are killed at forty.



Article by Sydney Esates
Country Schoolman March 1929

BIG CRANE ON TRACTOR FEET SPEEDS SWAMP WORK



Big Crane in Operation, and a Close View to Show How the Derrick Rests on Tractors

Moving a hill into a swamp was a big but comparatively simple task in Germany, as engineers made use of a huge traveling crane to convey the dirt. It had two swinging arms that lifted the soil from the slope and then deposited it in the swamp. Further speed was made possible by the fact that the crane was carried on endless-tread tractors so that the entire outfit could be moved about quickly, while at work. For longer transportation the crane is disassembled.

MILE COST OF RUNNING AUTOS SIX AND A HALF CENTS

Data collected from the operation of more than 800 automobiles in different parts of the United States and on various kinds of roads, show that the average cost of running a car is six and one-half cents a mile. These figures have been gathered by the Iowa State Engineering Experiment station under the direction of T. R. Agg, highway engineer. Based on an annual travel of 11,000 miles, the average for all the cars on which reports were received, the operating costs range from four to nine cents a mile. Medium-

weight six-cylinder automobiles cost 8.4 cents per mile. The medium-weight four-cylinder was approximately two cents less. Interesting facts were revealed as to the effect of good or poor roads on operating costs. Estimated savings in the average car-running costs due to road improvements were nearly one cent per mile, by changing from an intermediate road to one of high-type construction; 1.07 cents a mile on a low type changed to intermediate type, and 2.06 cents a mile when the low type was changed to a high. The data were compiled from a study of cost records on approximately 800 automobiles and 900 trucks.

TESTS WITH MODEL RUDDERS AID BOAT SAFETY

Interesting experiments with model ships and rudders have been conducted by Prof. Charles F. Gross, of the University of California, in order to check accidents which not uncommonly occur in steering ferryboats into the slipways. In spite of the best efforts of the pilots, the boats often fail to enter the slips centrally. Professor Gross discovered that, in most cases, the rudder with its area low in the water, showed a more decided tendency to alter the course of the ferry than did the usual type of rudder with its area nearer the surface. There was also marked effect on the steering when the rudder was long on the surface of the water, long at the bottom of the ship or had a small portion of its area forward of the center line of the rudder stock. The tests did not take into consideration such factors as tide conditions, misjudgment or failure on the part of the steering gear.

Associate Prof. Marine Eng. & Naval Arch.



Interior of the "Jubilee Stamp House" at North Bersted, Eng., Showing Some of the Stamp Decorations

SOWER FOR SMALL GARDENS — SAVES STOOPING

One seed is dropped at a time from a simplified sower, introduced for the small garden. It permits keeping straight rows, saves time and labor and allows the operator to stand in an upright position.

Hand-Operated Seeder for the Small Garden



DECORATE ROOM WITH STAMPS VALUED AT THOUSANDS

More than 8,000,000 stamps are included in a collection housed in a cottage at North Bersted, Eng., known as the "Jubilee Stamp House." They are used on the walls as substitute for ordinary wall paper, decorations have been fashioned from them, and they ornament busts and other articles in the house. The entire collection has an estimated value of about 400,000 dollars.

ENORMOUS QUANTITY OF GOLD CARRIED BY GULF STREAM

According to estimates by M. Georges Claude, famous French inventor and scientist, the Gulf Stream, in passing a given point off the Florida coast, carries about two cents worth of gold in each cubic meter. This would amount to about \$800,000,000 worth of gold an hour over the whole extent of the stream at the same point, he declares. At present, there is no practical method for separating this "rainbow" gold from the sea water.

shown at British Industries Fair

Carnal locate

the 21st of the 19th

1900

Inter. ...
Culver City
Calif
new in g. ...
... 24 inch

2257

Mar Zactor Studios
Hollywood, Calif



-ANITA PAGE-

BLONDE — NO-1

LIPS- NO-2

KEY NO-1

EYELASHES - BROWN NO-2



-JOAN CRAWFORD

RED-HEAD — NO-4

LIPS NO-5

KEY NO-4

EYELASHES - BROWN NO-5



DOROTHY SEBASTIAN

BRUNETTE - NO-3

LIPS NO-3

KEY NO-3

EYELASHES - BROWN-3

ALL NUMBERS STANDARD PANCHRO-

BEST RADIATOR
PAINTS FOUND
BY TESTS

Interesting experiments performed at the University of Michigan have furnished the data as to the best kind of paint to apply to the radiator so that heat losses will be reduced to a minimum. The tests showed that some kinds of paint increase the heating efficiency of the unit. One radiator was left unpainted and the other coated with five different types of paint, including aluminum, flat brown, cream, liquid gold and white-gloss enamel. Both were operated under exactly the same conditions. Taking the bare cast-iron foundry finish as 100, liquid gold showed a relative performance of 93.5 or six and one-half per cent less. The radiator was then coated with cream paint and the readings showed 104.9 or four and nine-tenths per cent better than the bare iron. Adding a coat of aluminum reduced the performance to 94.6, and a layer of brown brought

Make-Up Chart as Prepared for Three Movie Stars; the Shades Refer to Standard Hues That Already Have Been Tested under the Lights

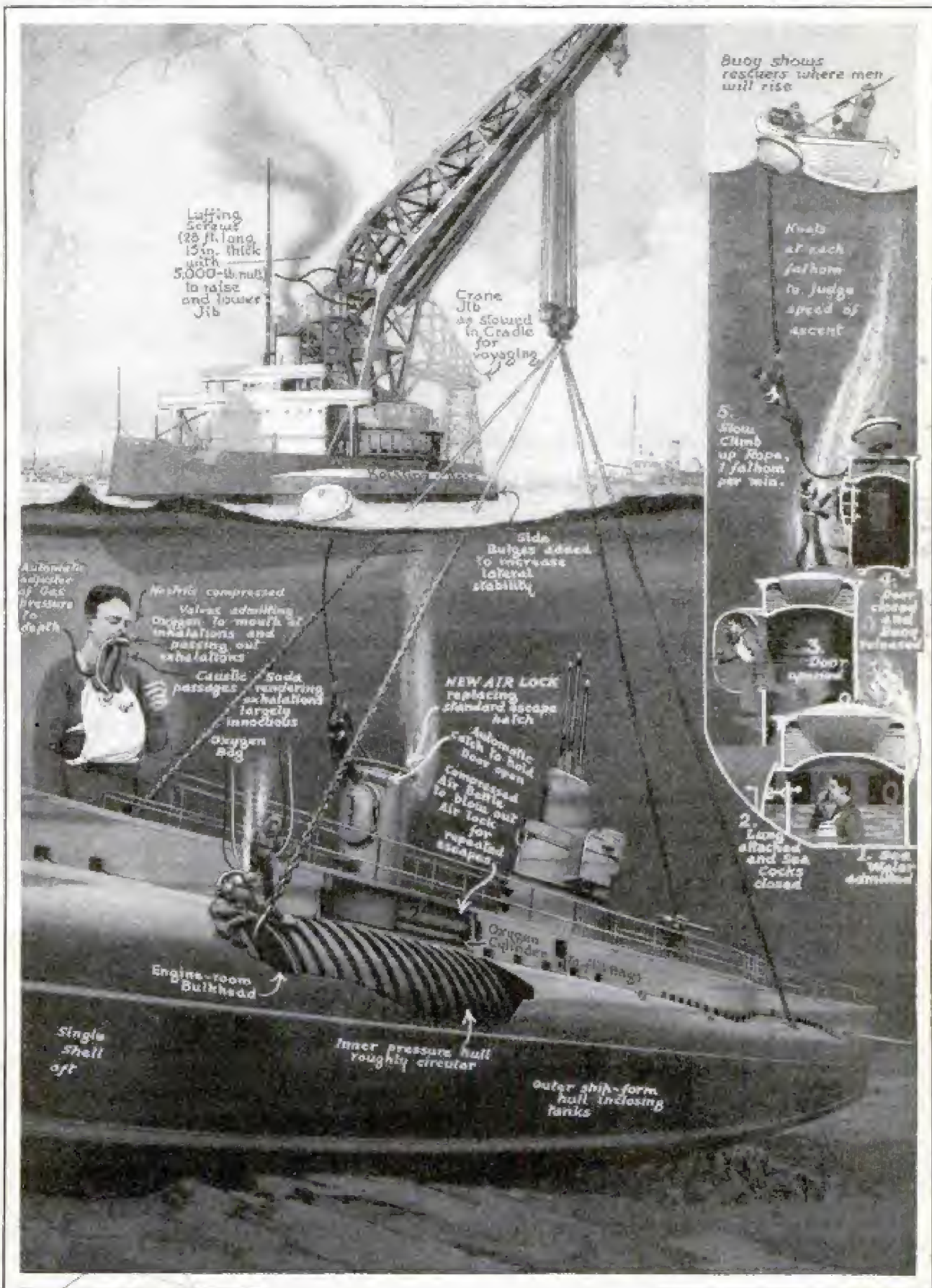
MAKE-UP KEY FOR ACTRESSES
IMPROVES MOVIES

So that actresses' make-up may appear uniform when photographed, a color chart, which serves as a guide to performers and photographers, has been devised at a Hollywood studio. Hair, lips and eyes are codified according to scale which already has been tested.

¶ We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

the figure back to 104.7, while the white enamel, applied on top of the brown, resulted in a relative performance of 103.6. The summary of all the tests indicated that the performance of radiators coated with the flake-metal paints was 93.8 average and for the lead paints 103.7 average. In a room at a temperature of eighty degrees Fahrenheit, the metallic-painted radiators would have a heat-emitting ability of ten per cent less than if covered with colored lead paints. At seventy degrees Fahrenheit, the reduction would be about thirteen per cent. The tests are especially timely, as greater use of gas has emphasized the need of efficient equipment.

SUBMARINE LUNG SAVES TWO FROM OCEAN'S DEPTH



© S. W. Clatworthy

For the first time in history, two men escaped from a submarine, sunk 200 feet beneath the surface, recently in tests off Florida; the escapes were made possible by an oxygen mask, or "lung," permitting breathing under water; sketch shows the great navy lifting crane, which so far has not proved a success

see March 300.
 demonstrated by Lieut Charles Momsen,

Washington Bureau of Construction and Repair
 Naval



From the Road to the Truck; Removing Snow with the Special Scoop and Conveyor; If the Trucks Are Not Loaded, the Snow Is Thrown to One Side, Out of the Way

SNOWPLOW LOADS TRUCKS SAVING HANDWORK

Besides clearing the road, a snowplow, tested in Chicago, loaded the trucks at the same time, saving extra handling of the material. If the wagons are not to be used at the plow, it throws the snow far to one side of the road. With deep snow, a truck was filled in less than half a minute.

AUTOMATIC COUPLING STOPS GEAR-SHIFT TROUBLES

An automatic coupling, which makes it possible to change automobile gears up or down without clashing, has been invented by P. M. Salerni, an Italian engineer living in London, and tested with success by the chairman of the technical committee of the Royal Automobile club. The device can be fitted to any car with an ordinary gear box,

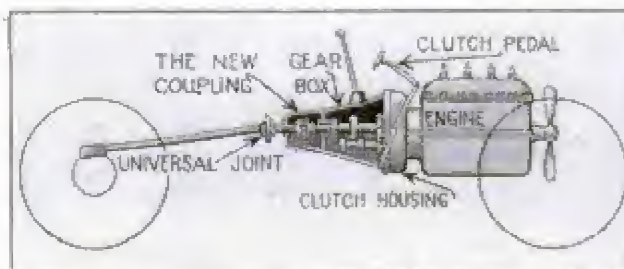


Diagram of the Clutch System, Showing the Location of the Special Coupling That Prevents Clashing

and will cost, it is estimated, about \$10. It consists of an ordinary dog clutch, between two members of which there is a ring. The coupling is mounted in the gear box behind the gears and in front of the universal joint connecting the gear shaft to the propeller shaft. The purpose of the ring is to prevent the dog-clutch members from engaging each other when both are turning at exactly the same speed. In use, the coupling acts as a free-wheel device, giving the same effect as when the clutch is depressed in coasting, but it has the advantage that the normal drive can be regained at any time by simply depressing the clutch again, and the engine can be used as a brake, without shifting in or out of gear. In tests by motoring writers of

the London papers, gears were shifted from bottom to top and from top down, with the engine turning up to maximum speed, and in each case the coupling took up the load with ease.

Klauer High Co. Manufacturing
Dubuque Iowa

2/11/22

2/14/22

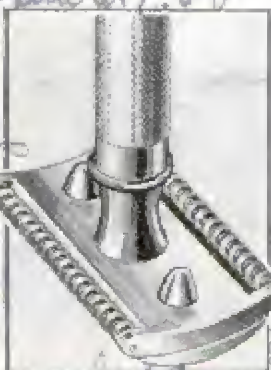
new road coupling

REFUELING TO AID FLYERS IN SECOND OCEAN HOP

Captain Kohl and Colonel Fitzmaurice, who flew with the late Baron von Huenefeld in a non-stop flight from Europe to Greenly Island, are scheduled to make another air voyage to this country in a tri-motored Junkers plane this summer. Their ship is to be fitted with large floats instead of with wheels so that they can take off from a lake near Berlin, and they will have but comparatively little gasoline aboard, as they expect to be refueled on the way as was the "Question Mark" in its remarkable endurance flight. The German aviators expect to go from Germany to Lisbon, where they will receive fuel when starting for the long trip to New York. If they meet with contrary winds, they will summon another ship for refueling by the use of radio. They hope to reach New York in fifty hours and have expressed the opinion that the refueling system promises to be of great aid in trans-oceanic travel by air.

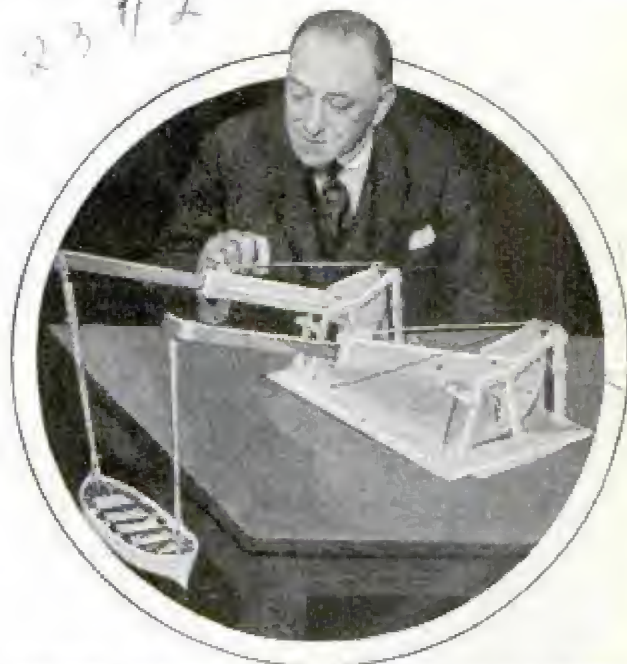
ROLLER-GUARD SAFETY RAZOR HELPS IMPROVE SHAVE

Smoother shaves with increased safety are said to be possible when a roller guard is attached to a popular make of razor as a substitute for the usual rake type of guard. It rolls the skin to the proper angle for the blade, locks the corners of the blade so that they cannot cut the face and permits the entire edge to function with equal efficiency, the manufacturers declare.



TIGHTENERS ON WINDOW SASH KEEP OUT COLD

As a substitute for weather stripping, a wedge and locking device, now on the market, fastens the window sash tightly, but allows it to slide freely. The unit is easily installed, stops rattling and keeps out cold air and dust.



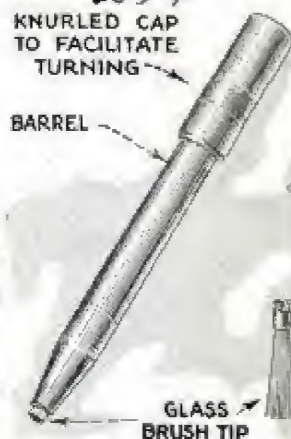
Improved Davit That Speeds Lowering of a Lifeboat and Throws It Far from the Side of the Vessel

DAVITS TO THROW LIFEBOATS —FARTHER FROM VESSEL

Davits that will permit lowering lifeboats more rapidly and will afford greater clearance, have been tested by an English inventor. He asserts that his apparatus will lower a boat in three minutes and throw it twenty-four feet clear of the rails, as against the standard of four feet and the twenty minutes, or thereabouts, which are usually required for the lowering of such a craft.

INK ERASER MADE OF GLASS OPERATES LIKE PENCIL

Shaped and operated like a refillable pencil, an ink eraser now on the market consists of an adjustable brush made of strands of glass, finer than hairs. The tip is tapered and is forced into a compact mass at the point where it projects from the holder. Extra brushes for refills are furnished, and the eraser is said to be extremely efficient in removing any kind of ink, including printing.



Handwritten: a Currier London

Handwritten: H. H. Spencer, 46 St. Louis Ave., New York City, Tel. 4-1111, 2-15, 9th Ave.

Handwritten: Shaw-Borden

Making Home

Steel Holder for the Laundry Bag
Simplifies the Task of Making Up
the Laundry and Serves Both as
a Table and as a Container; It
Is Thoroughly Ventilated



Rapid Fruit-Juice Extractor
Is Quickly Attached to the
Table and Comes Apart for
Easy Cleaning; High Bowl
Prevents Spattering and
the Mechanism Is Fitted with
Ball Bearings



This Baby's Milk-Bottle Cap Has a
Handy Tab for Easy Removal, the
Invention of a Nurse; It Is Made
of Pure Para Rubber and May Be
Boiled for Sterilization



Splash Preventer for High
Heels; It Is Easily Slipped
over the Regular Heel and Has
a Base of Sponge Rubber That
Soaks Up Muddy Water and
Squeezes It Out in Walking,
Eliminating the Splash

Tacks a Pleasure



Wood and Metal Handle for the vacuumator
Not Burn; It Is
and Lower
Just-
Pin-
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ing . . .



Infant's Improved High Chair Has an Adjustable Back Rest; a Safety Bar, to Keep Child from Standing Up and Falling Out; Safety Strap to Prevent Sliding under Table, and a Footrest, Adjustable to Different Heights



Easily Slipped onto the Broom Handle and Thrust Out of the Way When Not in Use, This Brush Is Designed for Reaching into Corners



To Prevent Slipping in the Bathtub: This Mat Is Fastened Down with Vacuum Cups Which Are Easily Removed and Hold Securely When Pressed Firmly upon the Bottom of the Tub; the Mat Is Also Useful on a Manicure Table, to Protect Instruments, and in a Sink, to Keep Dishes from Breaking



Model of a Unit in Chicago's Water-Supply System; It Shows How the Water Is Taken In from the Lake through Crib and Intake Tunnel and Pumped into the Mains

HOW CITY RECEIVES ITS WATER SHOWN BY MODELS

One of the most interesting displays at the recent twenty-fifth anniversary of Chicago's City club was a model of one of the water-supply units that serve millions of gallons daily from Lake Michigan. The replica clearly explained the relative positions of the crib, the inclosed reservoir far out in the lake where the water is purified and directed into the intake shaft, the pumping station on shore where the water is forced into the mains, and the method of distributing the supply to apartment buildings and other structures.

ODD MIRAGE HAMPERS AUTOIST IN SPEED-RECORD TRIALS

Capt. Malcolm Campbell, who is trying to lower the world's speed record on a novel motor track in the desert near Verneuk Pan, South Africa, has had trouble with the moving mirage, a phenomenon which has baffled expert riflemen and native hunters although they are well accustomed to mirages. The marksman finds that he has to allow for drift or "windage" on a target which seems to be constantly moving to the left or right. This is due

to the extreme heat and radiation on the dry veldt, where rocks, trees and other natural objects sometimes seem to be slipping silently across the sights. When a racing motorist has to look 300 or 400 yards ahead on the track, he may be deceived as to the course of the car and meet a serious accident. The strange mirage has given rise to the name of the Verneuk Pan, which means "Deception Desert."

CLAMP FOR BATTERY TERMINAL REQUIRES NO SOLDER



Boltless storage-battery terminals, that are said to end corrosion troubles and require no solder, are now available for use on motor cars and elsewhere. Only three simple operations are necessary to

install them. The lead clamp is loosened, the terminal is placed over the battery post and tapped in place with a hammer, and the clamp is then tightened with wrench or pliers.

12' 10" Battery terminal
1394 1394 1394
1394 1394 1394

**WELD PIPE LINE ELECTRICALLY
TO PREVENT GAS LEAKS**

Linking New Mexico and Texas, a 205-mile gas pipe line is being electrically welded. Twenty-seven welding outfits, some mounted on tractors and driven by the tractor engine, and others on trucks and trailers, are being employed. The pipe is sixteen inches in diameter, is in thirty-foot sections, and seven of these lengths are handled at one time. One crew fixes the sections temporarily in position by tack welding and another completes the work. Every seventh joint is an expansion joint, to give added flexibility and to allow for expansion and contraction when the main is in service. Each operator is able to make approximately thirteen welds in ten hours by using a welding electrode, three-sixteenths of an inch in diameter, and current ranging from 175 to 190 amperes.

**METAL PLATE POLISHES SILVER
WITHOUT RUBBING**

Silver or gold objects are restored to luster in a few minutes without the use of powders or other cleaning agents by means of a small metal plate. This is placed in hot soft water with the article to be cleaned touching it. In a short time, the tarnish will have disappeared and the article may be removed and dried. The plate itself is kept clean with scouring powder and will last for a number of years, it is claimed.



Method of Using the Silver-Cleaning Metal, and, at Right, Close View of a Sample, to Show Its Form



Fresh-Fruit Dispenser for the Convenience of Railway Travelers; It Holds Several Different Kinds

**COIN-IN-SLOT FRUIT VENDOR
SERVES RAIL TRAVELERS**

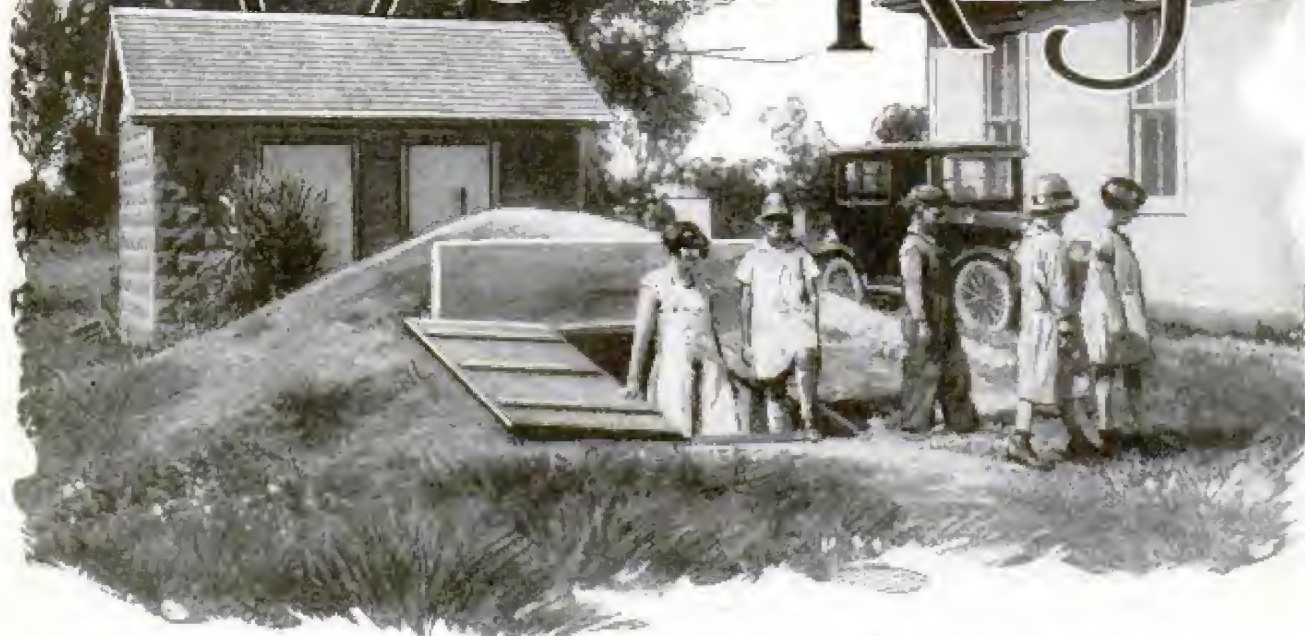
By dropping a coin in a slot, passengers at London railway stations procure a variety of fresh fruits from a cabinet that keeps the contents clean. The vendor accepts coins of two denominations.

**TEARS REGARDED AS BLESSING
FOR THEY KILL GERMS**

Tears contain a chemical that kills germs and are therefore of benefit to the eyes even though weeping usually is associated with sorrow. One teaspoonful of the pure chemical substance found in tears has antiseptic powers equal to more than 100 gallons of salty water against bacteria that may hurt the eyes, tests have shown. The same material is discovered in the white corpuscles of the blood which wage war on harmful germs.

Refer to Consolidated Automatic Merchandising Corp. 245-5th Ave. New York

The Storm King's



In Some of the Prairie States, Tornado Drill Is as Important as Fire Drill in the Schools; Here the Teacher Is Shepherding the Pupils Out of the Tornado Cellar

By CALVIN FRAZER

EVERY severe blow that occurs in a settled portion of the United States administers an equally severe blow to the pride of American engineers and builders. Despite the great skill attained in the building arts, the excellence of modern materials, including steel and concrete, despite all that has been learned about the laws of the winds and the mechanism of storms, not a year passes in which many buildings and engineering works of all kinds do not topple like the proverbial house of cards before the tempest's fury.

Less than two years ago a tornado plowed through the city of St. Louis. Scores of buildings were reduced to mere rubbish heaps and many hundreds more were badly shattered. Twice within the last few years, cities and villages on the coast of Florida have been wrecked by tropical hurricanes. The average annual windstorm damage to buildings in this country amounts to millions of dollars, to say nothing of the killing and maiming of human beings caught in the collapse of these buildings or hit by flying fragments.

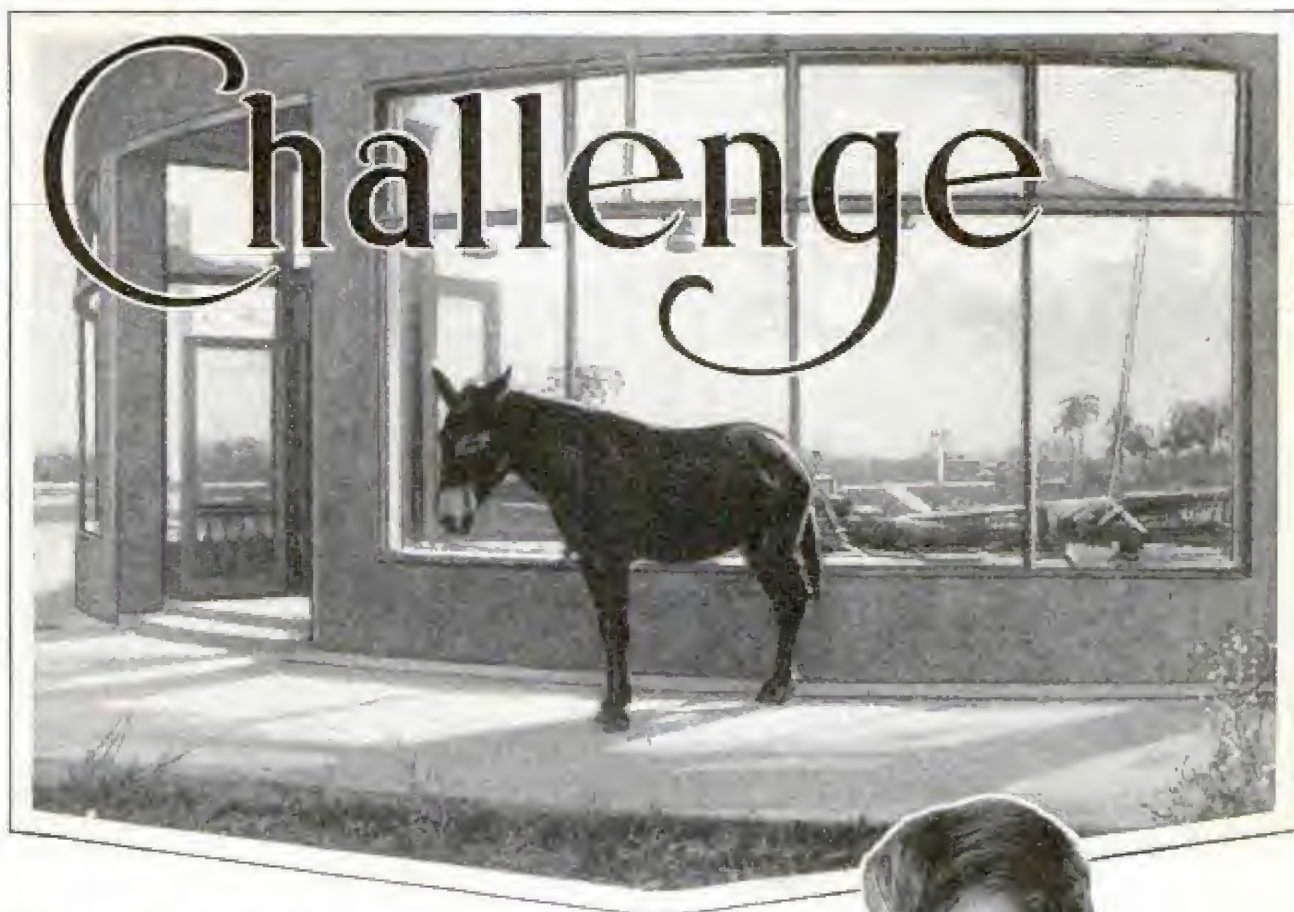
With all this devastation, the maximum

possible damage by a single storm has never been experienced or even approached. Tornadoes, the most furious storms on earth, occur at an average rate of about a hundred a year in the United States, but the skyscraper district of a great American city has never yet been hit by one of them. Sooner or later this may happen, and, if it does, the results are likely to be appalling.

What can be done about these tremendous losses? Even by methods now known, it is probably quite feasible to construct buildings that would be proof against any wind that blows, including the most violent tornado, but the cost of doing so on a general scale would be prohibitive. It seems, however, a practical proposition to make buildings of all kinds so strong, that they will pass unscathed through the worst storms that ordinarily occur in their localities, and will suffer only moderate damage in storms of extraordinary violence.

In designing a sewer system, an engineer studies rainfall records, if they are available, and plans the system to take

Challenge



care of the most intense downfall that occurs, say, once in twenty years, on an average. He does not plan for the cloudburst that may or may not occur in the course of a century. The tornado and, in this country, the full-fledged tropical hurricane bear much the same relation to ordinary windstorms that the cloudburst bears to average rainstorms. They are everywhere exceptional events and their destructive effects are always confined to small areas.

The fact that the village of Codell, Kans., has not only been visited by three tornadoes, but experienced these storms in three consecutive years and in each case on May 20, is certainly one of the most amazing coincidences on record. Contrary to popular belief, Kansas is not more afflicted with tornadoes than some of the other states of the middle west. The average number per annum during a

Top, What a Tropical Hurricane Left of a Drug Store at Pompano, Florida: Just the Front Wall and Doors; Below Is an Electrical Recorder Which Charts Wind Velocity and Direction, Rainfall and the Amount of Sunshine Each Day



period of thirty years was 8.8. As the area of the state is 82,000 square miles and as the destructive area of the average tornado is about ten square miles, it follows that any given locality in Kansas is likely to suffer damage from a tornado only once in about 930 years.

The tornado frequency is lower in some



Royal Palm at Naranjito, Porto Rico, Pierced by a Board Torn from a Building; the Tree Is Fourteen Inches in Diameter

other parts of the country, but only an insignificant area of the United States is absolutely exempt from these storms. During twenty-three years, ending 1923, Pennsylvania had forty-two tornadoes, New York thirty-five and Massachusetts ten. During the same period, 177 occurred in Kansas, 124 in Iowa, and seventy-two in Nebraska. Per unit area, Massachusetts actually had more tornadoes than Nebraska and more than half as many as Kansas and Iowa. The District of Columbia was visited by two tornadoes during the year 1927, and one of these wrecked buildings within a mile of the capitol.

Next in violence to tornadoes among the storms come the tropical hurricanes that occasionally visit our southeastern coasts during the months from June to October, inclusive. The occurrence of one of these storms in any particular lo-

cality is a much rarer event than most people suppose. Not all the tropical cyclones that reach our coast are severe enough to rank as hurricanes, and, in those that are, the winds of destructive force are limited to a comparatively small area near the storm center, so that the track within which damage is done is, in some cases, only a few miles in width. Of the eighty-four tropical hurricanes that have occurred on the Gulf and Atlantic coasts during the past fifty years, only sixteen were classed by the weather bureau as great hurricanes, and even in these the path of destruction was only forty or fifty miles wide and a few hundred miles long.

The barometric lows of non-tropical origin that travel across the country from west to east, usually leaving the continent by way of New England and the Gulf of St. Lawrence, are sometimes attended by winds of hurricane force, especially on the coasts and in the mountains. The greatest wind velocity ever registered instrumentally in the United States was 186 miles an hour at the summit of Mt. Washington, N. H., Jan. 11, 1879, but with the type of anemometer employed, this reading requires reduction to a true velocity of about 140 miles an hour. One of the most violent storms, other than tornadoes, that ever occurred in the northern part of the country was the so-called "Olympic Blowdown" of Jan. 29, 1921, which felled thousands of big trees, aggregating about 8,000,000,000 board feet of timber, in the Olympic peninsula of western Washington.

As may be inferred from the preceding paragraphs, a good deal is known about the relative frequency of storms in different parts of the United States, but unfortunately not nearly so much is known about the velocity, or force, attained by the winds in these storms. Probably no other kind of climatic statistics is so unsatisfactory as the figures relating to wind force. There are several reasons for this.

In the Old World the majority of such figures are based on estimates, which are considered to be, on the whole, more trustworthy than instrumental records. In this country, the wind is measured at the 200 regular stations of the weather bureau and at a few other places by means of a whirling arrangement known as a cup



The Hurricanelike Blast, Known as the "Avalanche Wind," Which Rushes Out in Front of a Snowslide, May Demolish Houses and Uproot Trees Hundreds of Yards Away

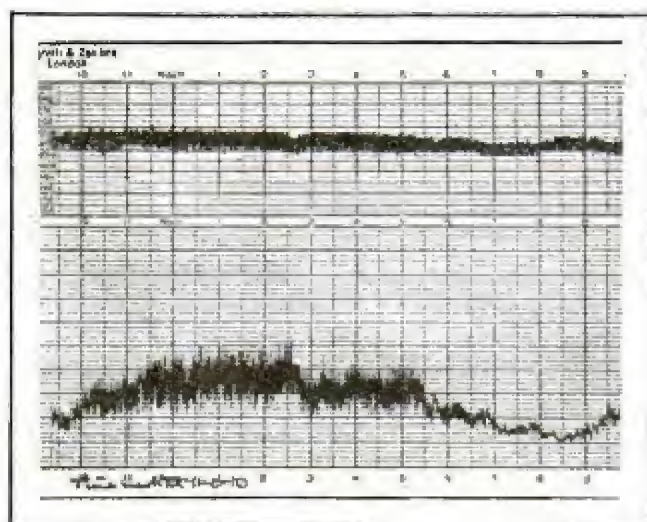
anemometer, the hemispherical metal cups of which turn in the wind. In the standard instrument now used, there are three cups, instead of four, which was formerly the rule. The new type of instrument gives more accurate and consistent results, especially at high wind velocities, but it is still subject to certain well-recognized defects.

One defect common to all anemometer records is that they are greatly affected by the exposure of the instrument and especially by its height above the ground. The force of a wind generally increases with altitude. Hence an anemometer placed on top of a skyscraper indicates stronger winds than those prevailing at the level of ordinary buildings. In a city, on the other hand, the instrument must generally be placed at a great height in order not to be screened from the winds by surrounding buildings.

The cup anemometer has another serious fault from the point of view of the engineer, who wishes to know the maximum force attained by the wind in storms. A wind, especially near the earth's surface, is not a steady flow of air, but is

made of innumerable brief gusts and lulls. In the course of a few seconds, its force may increase, say, from forty to sixty miles an hour, and then drop as quickly to twenty miles. Instruments known as pressure-tube anemometers have been devised for registering these brief fluctuations, but they are complicated and costly, and very few of them are in use. The cup anemometer does not register gusts, but merely shows the average strength of the wind over a period of a minute or more; hence this instrument probably never indicates the greatest wind force to which neighboring buildings are exposed in a storm. In weather-bureau practice, the maximum velocity is the average for a five-minute period, while the extreme velocity is obtained from the fastest single mile of wind recorded.

In the Florida hurricane of 1926, a three-cup anemometer at Miami Beach gave a corrected maximum reading of 123 miles an hour and an extreme of about 150 miles an hour before it was blown away—the usual fate of anemometers in violent storms. Meanwhile the force of the wind during gusts may well have reached 180

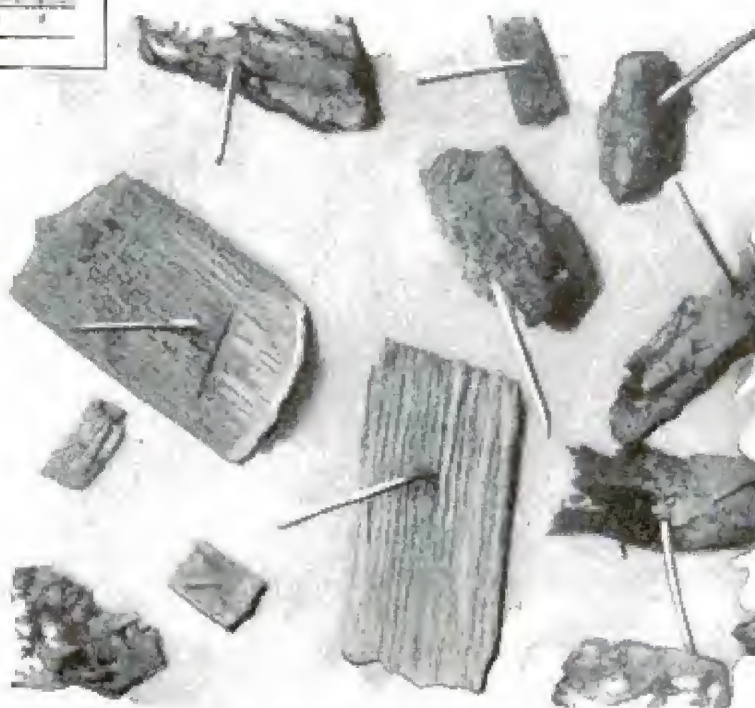


or 200 miles an hour. At San Juan, Porto Rico, during the hurricane of Sept. 13, 1928, the three-cup anemometer at the weather-bureau station registered a maximum of 150 miles an hour and an extreme of 160 miles an hour just before one of its cups was carried away by the wind. An hour later, another cup disappeared, and finally what was left of the instrument was blown away and deposited a third of a mile from the station.

Another difficulty in connection with wind data, from the engineering standpoint, is that there is great uncertainty about the relation between wind velocity and wind pressure. Not only have different formulas been employed for reducing velocity in miles per hour to pressure in pounds per square foot for winds blowing at right angles to a surface, but the pressure is known to vary with the area exposed to the wind, being less per unit area for large surfaces than for small. When the wind does not blow at right angles to the surface, the relations between velocity and pressure are complex in the extreme. This fact has been well brought out in a long series of experiments made at the bureau of standards, in which small models of buildings, chimneys, etc., were exposed at various angles in a tunnel to winds of known velocities and the resulting pressures on all parts of their surfaces measured.

In view of all these facts, it is not strange that much diversity of opinion

prevails among engineers as to what provision should be made for wind stresses in the design of buildings and other structures, and should be required by building codes. Controversies on this subject have raged for years, both in this country and abroad. It was, in fact, an event of half a century ago—the famous Tay Bridge disaster of 1879, in which a section of the world's longest railway bridge, at Dundee, Scotland, was blown down, with heavy loss of life—that first aroused British en-



The Lower Record on the Chart Shows the Lulls during a Wind-storm; Bottom Picture, Straws Driven through Bits of Wood

gineers to the necessity of investigating the subject of wind pressure, and some of the questions raised at that time have never been satisfactorily answered.

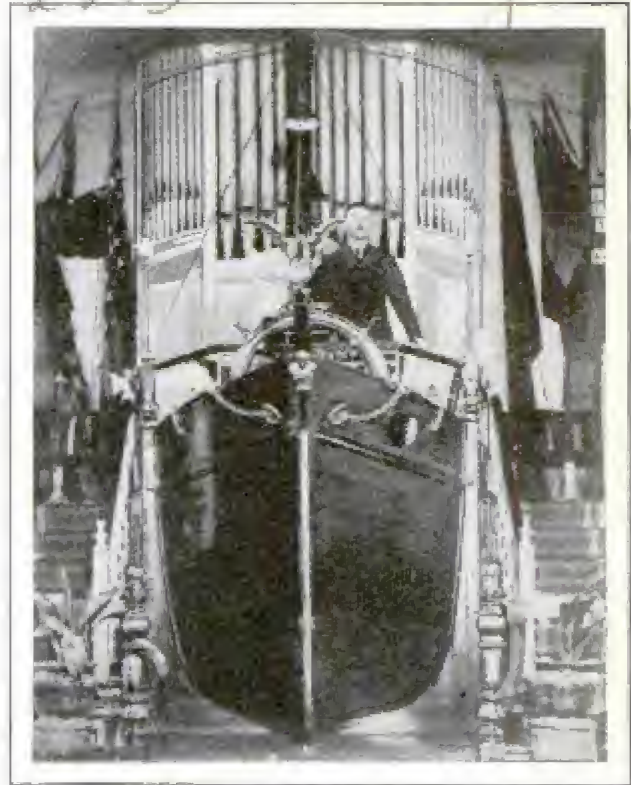
Nowadays the usual sequel of a destructive storm in the United States is a careful survey of its effects on buildings, conducted by some of the engineering societies or by government agencies.

Though windstorm damage to buildings cannot be entirely prevented, it certainly might be much reduced, and this would contribute to the safety of human beings in a storm area. As an example of what can be done in this line, mention may be made of the fact that, when a tornado passes over a building, there is a tendency for the walls to be thrust outward, owing to the difference between the normal pressure of the atmosphere indoors

and the reduced pressure in the storm vortex outside. This difference amounts, in extreme cases, to about one-tenth of an atmosphere, giving a sudden thrust of about 200 pounds per square foot. The forest products laboratory has been studying the phenomenon, and finds that a simple and inexpensive system of automatic vents, which would open when the pressure occurs, would relieve pressure on the walls and prevent their collapse.

Absolute safety for humanity in a tornado can be found only underground. There has been a marked revival of interest recently in tornado or cyclone cellars; they have been constructed in large numbers in open country districts, where an approaching tornado can usually be seen several minutes before its arrival, so that people have ample time to seek shelter. The best refuge from a tropical hurricane is, in most cases, to be found well above the ground instead of below it, since these storms are usually accompanied by tidal waves on the coast and by torrential rains and floods inland. Mr. H. C. Hunter, of the weather bureau, says:

"The proper refuge would be low towers. Very firm anchorage and powerful framework are essential in these proposed refuges, and flimsy construction of the inclosed rooms must be avoided. Port-holes would be better than the strongest windows. Furthermore, it would be important to see that no trees grew near enough or high enough to fall against the refuge. Each of these refuges could serve an area of four or five miles square, if persons in peril could be persuaded to start before wind and rain became intense. There would need to be an able leader or committee for each refuge to watch constantly for need of repairs and to marshal the threatened residents." The feasibility of this plan depends upon the fact that, in most regions subject to tropical hurricanes, the coming of these storms is always heralded many hours in advance.



Unique Pulpit in Mission at Falmouth, Eng.; It Is Modeled after a Vessel's Prow

PULPIT LIKE VESSEL'S BOW SERVES PORT MINISTER

At a mission in Falmouth port, England, the minister preaches from a pulpit that closely resembles the prow of a ship. Regulation starboard and port lights, which are illuminated during the services, increase the effectiveness of the illusion. The pulpit was dedicated to the late King Edward VII and has been in service for seventy-five years.

LIGHTS TURN WITH WHEELS FOR SAFER DRIVING

By means of an attachment developed by a New Zealand man, the headlights of



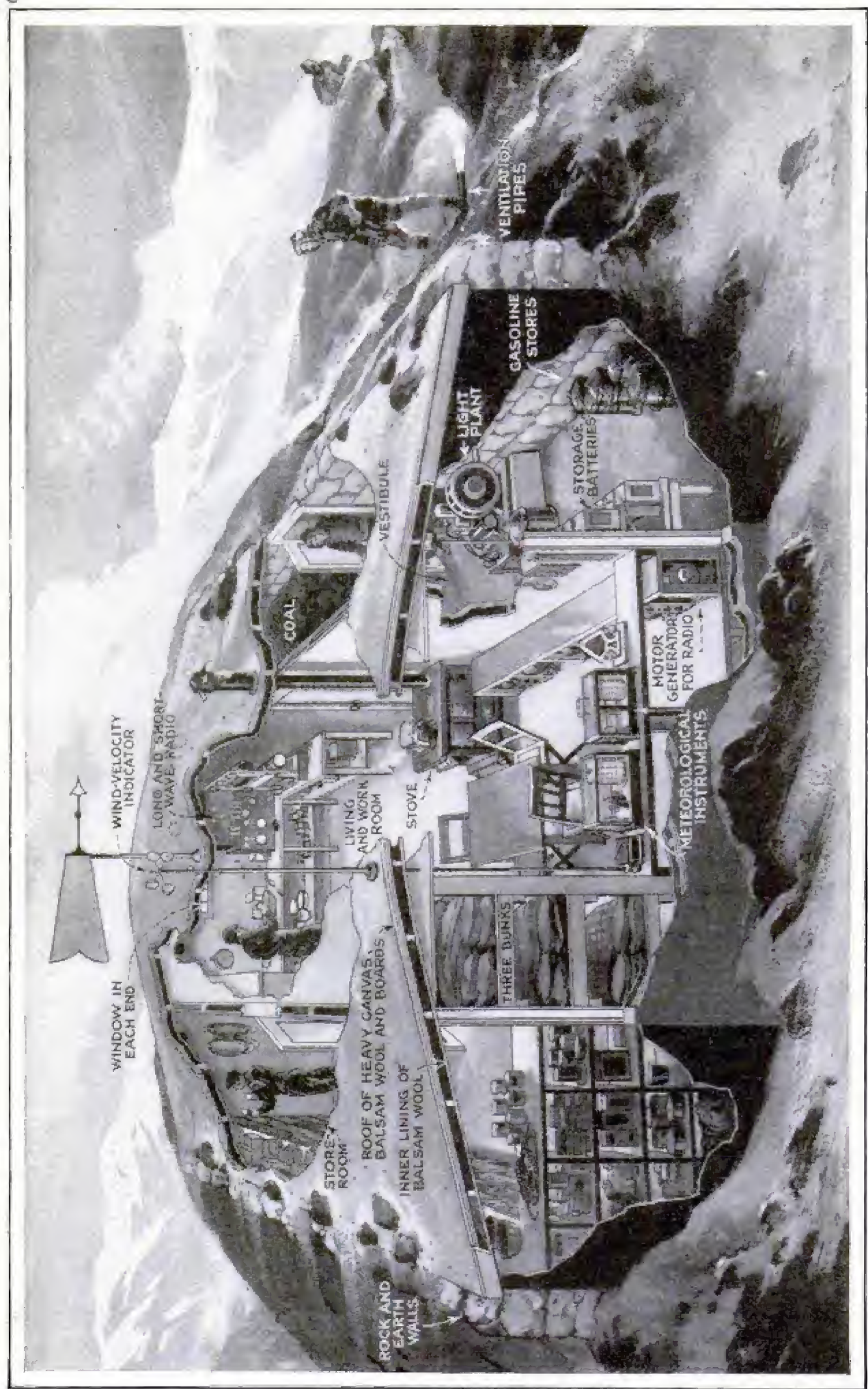
When the Front Wheels Turn, the Headlights Turn with Them, Directing Their Rays around Corners

the automobile turn with the front wheels so that adequate illumination is provided in going around curves. Better visibility at the side of the road is also claimed, and the device is said to reduce the glare in the eyes of motorists driving in the opposite direction.

*Peter Mackenzie
Patent Appraisals Co.*

*273 Bank St.
Ottawa, Ont. Canada*

2286



Where Three Men Spend the Winter on the Greenland Ice Cap, a Diagrammatic Sketch of the University of Michigan Observatory at Mt. Evans, Which Keeps in Touch with the World by Short-Wave Wireless during the Long Months of the Winter Night

RADIO *in the* ARCTIC



Sending Up a Sounding Balloon from the Arctic Ice, to Chart the Wind Velocity and Direction at the Higher Altitudes; One of the Daily Tasks at Mt. Evans

MT. EVANS, Greenland, via radio, station NX-1-XL to station W-8-AXZ, Ann Arbor, Mich.—In this farthest outpost of the University of Michigan, so far north that we see the northern lights in the southern sky, three men, two aerologists and a radio operator, are spending a six months' night in a little room that measures nine by fourteen feet.

The three are the winter's guard of Dr. William H. Hobbs' Greenland expeditions, which, since 1926, have been studying this home of the north wind, the great polar ice cap, 1,500 miles long and averaging 700 in width, covering all of the vast interior plateau of Greenland.

Save for an occasional Eskimo hunter, passing with a dog sled to visit his fox traps, not a single visitor has appeared since early fall, and none will come until early summer, but there isn't a spot in the world that we can't talk to almost every night.

Dick Byrd's operators come on the air, via short-wave wireless, from the Bay of Whales, in Antarctica, to exchange gossip about the relative merits of an antarctic summer compared with an arctic winter. As dusk falls and darkness stretches over the sea from Greenland to Europe, London, Paris, Berlin, and amateur and commercial stations in Denmark, Germany,

France, Italy, Norway, Holland and England, as well as ships at sea, tune in to exchange weather information, the day's news, or just gossip.

Later in the evening, when distant Europe is going to bed, two-way talk on the short-wave code set is just getting good with Canada, the United States and the rest of the western hemisphere, and the long-wave receiver is bringing in the strains of a jazz band beside the palm-lined shores of Florida, a speaker in New York, or music and voice from distant California. As the night progresses and darkness moves on to the west, reception from ships in the Pacific picks up. We have worked a ship rounding the Cape of Good Hope, South Africa, and an amateur in New Zealand on our short-wave set.

That's the change that radio has made in polar life in a few short years. Instead of hibernating for the winter, growing tired of each other's conversation and bored with life, we get the life of the world, from the day's news to the latest song, served up nightly.

Last summer, when we packed a little portable transmitter and receiver seven miles out to an emergency landing field, to establish a watch for Bert Hassell and Parker Cramer in the "City of Rockford," when they attempted to fly to Europe via

Mt. Evans observatory, we whiled away the time by tuning in on the round-by-round report of the Tunney-Heeney fight. And though the nearest church is 100 miles away, and a Danish one at that, and we have to send a message 7,700 miles by radio and cable to talk to anyone there, we get our church service in English every Sunday morning, thanks to the short-wave rebroadcasts from the United States.

There isn't anything within a hundred miles of us to cause radio interference, which may look like an ideal location, but we have our own radio troubles. For one, the January gale a couple of weeks ago, blew down a steel mast that took eleven strong men to erect last summer, and broke that fine mast into three pieces, which called for a lot of emergency repair work. And for another, though the short wave works perfectly in winter and fairly well at night in summer, the long-wave receiver, on which most of our music and voice comes in, is particularly troubled by fading from about ten o'clock at night until after midnight. As this is the period during which the display of northern lights is the strongest, there may possibly be a connection between the two.

Contrary to general belief outside, it isn't so cold here, even in the dead of winter. For seventy-two hours during January, when the hurricane blew at a hundred miles an hour or better (once it reached 120 miles an hour), the temperature at Mt. Evans remained consistently above freezing, averaging around forty above zero. Back on the vast ice plateau where the hurricane originated, it probably was fifty below zero, at the very least, but when the cold wind dropped down over the edge of the ice cap and slid to a level a mile and three-quarters lower than the plateau, the condensation was so great that the air was warmed ninety or a hundred degrees.

Station NX-1-XL is a short-wave radio transmitter using 250 watts of power, and working on approximately the same wave bands used by American amateurs. A gasoline engine, a storage battery and a motor generator supply the current needed. The short-wave receiver is of standard make, but equipped with only two tubes, while a long-wave receiver of three tubes gets the commercial stations

and the broadcast programs. A power tube has been added to increase amplification from either set.

The observatory on Mt. Evans is 12,944 feet above the waters of the great Soendre Stroemfjord, which stretches away seventy-five miles to the open sea in Davis strait. Because of that location, wind and weight both had to be considered in designing the aerial and the radio outfit itself, as everything was packed up the hill on human backs. A bamboo mast, used in the winter of 1927-28, swayed so badly in hurricane winds as to be almost useless, so this year's forty-foot steel mast was substituted, and it too failed.

We have experimented with all kinds of aerials, with wires stretched three feet, twenty feet and thirty-five feet above the ground; and with aerials ranging from a six-foot indoor aerial to an outdoor one of three hundred feet, yet, with all of these, the signal strength on the short waves remained virtually unchanged, and the only noticeable effect was better long-wave reception on the long outside aerial. The difficulty of keeping a long wire taut and eliminating swaying so far overbalanced the gain in reception that we soon abandoned it. Swaying of the aerial is the chief difficulty we have found with short-wave reception, and, because the indoor aerial eliminates it entirely, it proved the best. With waves only a few meters in length, even a slight swinging in the wind suffices to interfere with reception. As for directional effect, we found, with all of the aerials we tried, direction had no bearing on the signal strength.

While the weather in winter is fairly mild, there are some cold spells, enough of them to make it necessary to wrap the storage batteries in heavy insulation to prevent their freezing.

The observatory itself is really a three-room structure, built of timber and insulating wool, and banked with rocks and earth. The center room, nine by fourteen feet with a small window high in each end, serves as living room, dining room, bedroom, kitchen, radio office, meteorological laboratory, and anything else. The outer room is used for storage of coal and gasoline, and for the light plant and storage batteries, while an inner room, reached only through the main room, contains our



The Observatory as It Appears during the Short Summer, When Winter Supplies Are Being Carried up the Mountain on the Backs of the Scientists and Their Eskimo Helpers

food supplies. To save floor space in such cramped quarters, we sleep three deep on a triple bunk, which brings the topmost sleeper right up under the canvas, board and balsam-wool roof.

Mt. Evans' location at the edge of the great inland ice mass, and about seventy-five miles inland from Davis strait and the open sea, makes it one of the most isolated observatories in the north. During the summer months, Eskimo visitors, in kayaks—little skin-covered boats—can make the trip from the nearest settlement in about three days. Larger motorboats, coming by way of Davis strait and the Soendre Stroemfjord can, if the weather is fair, make the journey from Holstensborg in about the same time, but in stormy weather, it may take a week. Aside from these, the only summer visitors are an occasional hunting party in a umiak—otherwise a "woman boat"—which has places for ten or a dozen women to row while the men rest at ease. It was a hunting party coming up the fjord last summer that saw the signal smoke of the lost flyers Hassell and Cramer, on the hills of the south shore and notified us, so we could go over and rescue them. Their plane, the "City of Rockford," had been landed on the glacial ice two weeks before, and they had been walking for fourteen days, averaging an advance of not more than six miles a day, due to long detours around

open crevasses, and hummocks that could not be scaled.

There are no near neighbors to the observatory for the reason that, in the entire continent of Greenland, there are no inhabitants save in the little settlements along the coast. These coastal villages are situated just within the mouths of the great fjords, which carry the melting glacial streams down to the sea. In the villages are generally to be found the families of the Danish local governor, the doctor and the preacher, and a few Eskimos.

The news of the outside world, since wireless arrived, reaches Greenland daily, via a long-wave station situated near the southern tip of the continent. From there, it is relayed to the little settlement of Godhavn, halfway up the west coast. Every afternoon at five o'clock, Mr. Holton Moller, at Godhavn, goes on the air and, in the Danish language, repeats the news, which he has received in code. In each little fishing village up and down the coast, Eskimos can be seen moving toward the governor's house at the hour of the broadcast, to crowd around the door and listen to Greenland's only daily newspaper arriving by air.

If a message is to be forwarded from Europe to anyone at a station in Greenland, the usual course is to send it to Godhavn and Mr. Moller will sandwich it in with the day's news broadcast. No reply



During the Summer Months Several Exploration Trips Have Been Made into the Interior; This Picture Was Taken on the Glacial Ice Leading to the Inner Ice Plateau

can be sent by radio, except on those rare occasions when a vessel equipped with wireless comes into the fishing port, so, if an answer is urgent, it has to be sent down the coast on a small sloop manned by an Eskimo crew.

During the early winter of 1927-28, it was necessary to send some additional supplies into the observatory. The supplies came down the coast fifty miles by motorboat, and were then started overland on dog sleds. When the sleds were ready to return, it was necessary to notify the Danish governor at Holstensborg, which is about 100 miles from the observatory, to have the motorboat meet the dog teams. To get that message to Holstensborg by direct radio was impossible, as we have only a short-wave transmitter, and the village has only long-wave receivers.

Therefore the message was sent by short wave direct to Doctor Hobbs, at Ann Arbor, Mich., through the wireless station of the military department at the university. From Ann Arbor, Doctor Hobbs cabled the message to London, and from there it was relayed by telegraph and cable to Reykjavik, the capital of Iceland. There, the official Danish long-wave radio put the message on the air, to be picked up at Julianehaab, in southern Greenland. In long wave, it was relayed to Godhavn, and there the announcer included it in his next news broadcast, and Governor Bistrup,

at Holstensborg, got it, while we, listening in here for the daily news, heard it delivered. To get the word to the governor 100 miles away, the message had traveled 7,700 miles by long and short-wave wireless, telegraph and cable.

Getting to Greenland from the states is an equally round-about process, unless, like Comm. Donald MacMillan and other explorers, one has his own ship. The trip looks easy, as it is just up the coast past Canada and part of Labrador, and then across the Davis strait. There is no trade following that path, however, so the only boat connections are the Danish government steamers, which make the trip at intervals in summer. As a result, to reach the observatory from New York, you first go to Copenhagen, and then come back. The visit to Denmark is necessary in any case, to arrange your financing, as there is no money in circulation in all Greenland, except for some very small coins with which stamps can be purchased.

Doctor Hobbs arranges a credit in Denmark by depositing a sum of money each year with the government. The Danish governors are then notified that he has that credit, and we are ready for business. If we buy a caribou from a wandering Eskimo hunter, we give him a written order for the price agreed on. At the nearest village, seventy-five miles down the fjord, he can buy anything he wants in the store and cash the order, which will eventually

and its way up the coast to the governor at Holstensborg, and be entered in the books. All purchases, from the charter of a boat down to day labor, are paid for in the same way. As our orders for payment are all written in English, which the governor understands, but no Eskimo could either read or write, we are as well protected against alterations and forgery as though we used a check protector in writing them.

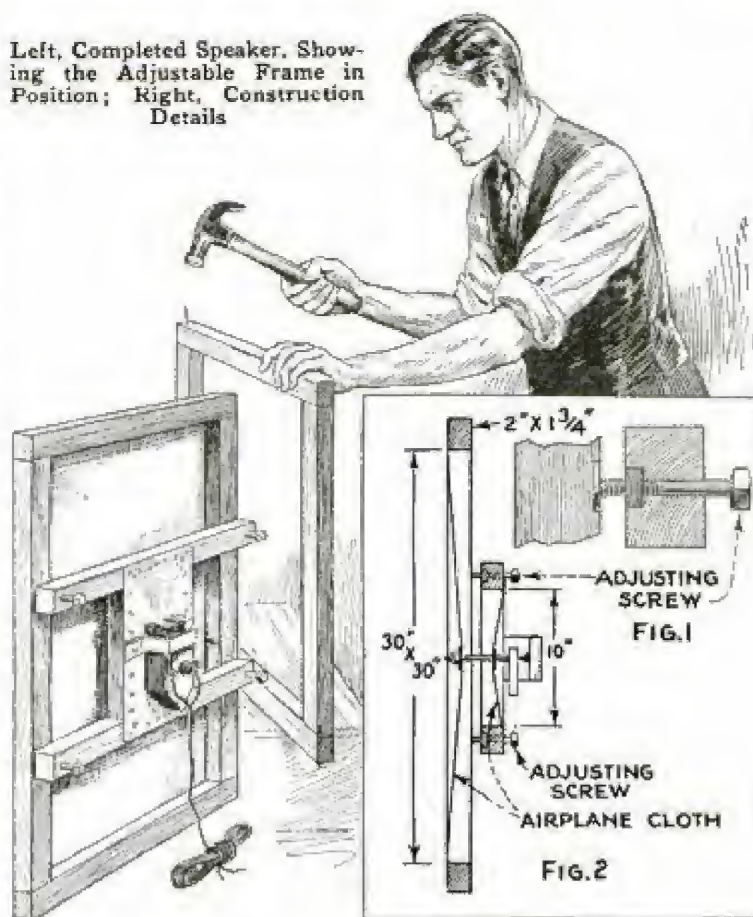
New Power Tube for A.C. Sets

A new power amplifier tube for supplying large undistorted output to the loud speaker is now available. The tube is known as the UX-245 and CX-345. It is designed for use in the last audio-amplifying stage of power-line-operated sets which supply not more than 2.5 volts to the last audio socket and also proper grid and plate voltages. The tube is capable of delivering a power output equal to that of the 210-type, but at a plate voltage not exceeding 250 volts. The filament is of the coated-ribbon type, assuring great strength and high efficiency. The tube is not interchangeable with the 171-A or any other power-amplifier tube. It can only be used with apparatus especially designed for it, and the high plate current must be kept out of the loud-speaker windings by some form of coupling, such as an output transformer or a choke coil and condenser. The characteristics of the tube are as follows: plate voltage, 180 to 250 volts; negative grid bias, 33 to 50 volts; plate current, 26 to 32 milliamp.; filament, 2.5 volts at 1.5 amperes.

Kink for Cloth-Speaker Builders

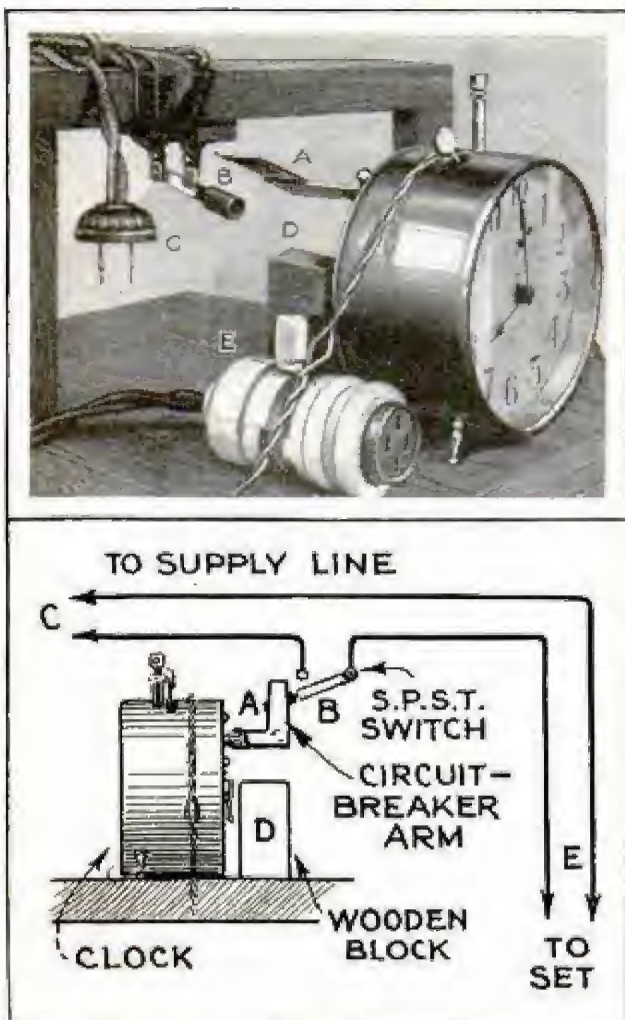
Airplane-cloth speakers of the tension-diaphragm type are easy to build and, when properly constructed, give excellent results. One point in their design, however, is frequently overlooked, which, if neglected, will quickly cause loss of tone and volume. This is due to tension changes in the cloth by atmospheric conditions and mechanical stresses. The

Left, Completed Speaker, Showing the Adjustable Frame in Position; Right, Construction Details



remedy lies in providing a means of adjusting the tension to meet these conditions. Speakers of this kind consist of two frames, clamped back to back, over which the airplane cloth is stretched as shown, the speaker unit with its threaded driving pin being mounted on the small frame at the rear (Fig. 2). The cloth diaphragms are perforated at the center and the driving pin is clamped to the cloth at front and rear with small metal disks and nuts. In constructing a speaker of this type in which the tension on the diaphragms can be varied, the frames must not be fastened together. The smaller one is held in position by means of four adjusting screws—common square-head bolts that rest on metal disks and are passed through nuts set into frame (see Fig. 1) so that the tension of the two diaphragms can be changed whenever they get slack or become overstrained from atmospheric changes.

Popular Mechanics' radio department offers its information service free to all readers of our magazine. We will be glad to help you with your problems, and will promptly answer all inquiries.



Above, Photo Showing the Arrangement of the Clock and Line Switch; Below, Diagram of Connections

Radio Set Disconnected by Alarm Clock

An old alarm clock may be set to throw a small switch disconnecting an a.c. radio set at any predetermined hour, if arranged as shown in the photo and diagram. The owner may retire and leave the set in operation with the assurance that it will be disconnected from the power line at the time the clock is set to throw the switch. The diagram is self-explanatory and little comment is necessary. The bell is removed from the clock and an L-shaped piece of metal is soldered to the alarm key. A small block of wood, nailed to the table in the position shown, stops the alarm lever after it has opened the switch. —H. E. Reynolds, Berkeley, Calif.

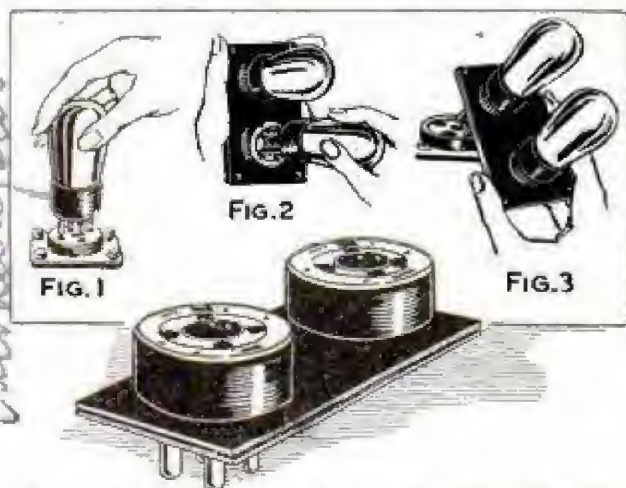
Shielded Lead-In Reduces Interference

Interference from elevator motors, vacuum cleaners, medical apparatus and sign flashers in some congested districts may be reduced by shielding the lead-in wire

to the set. Use lead-covered wire or ordinary insulated No. 14 in conduit, ground the metal sheath and extend the shielding from the set to the roof. The shielding will in some cases affect the reception slightly, and it may be necessary to increase the length of the horizontal antenna wire several feet to obtain the same signal strength. If interference of this type occurs only in the daytime, a single-pole double-throw switch may be installed so that the shielding can be disconnected from the ground and used as an extra pick-up for the antenna at night. To do this connect the shield to the center pole, the antenna to one terminal and the ground to the other.

Adapter for Two Power Tubes

Two power tubes may be used in parallel by means of the simple adapter shown in the illustration, greatly improving reception and tone. Employed in this manner, they prevent overloading of the power stage and eliminate undesirable loud-speaker noises. The unit may be quickly installed as follows: Remove the power tube from the socket of the last audio stage, as shown in Fig. 1, and insert it in one of the sockets in the adapter. Another power tube of exactly the same type is then placed in the other socket, as shown in Fig. 2. The adapter, with the power tubes, is then plugged into the last audio socket of the receiver, as in Fig. 3. The unit can be inserted but one way, so there is no danger of making wrong connections. Either 112, 171, 210 or 250-tubes may be used in parallel.

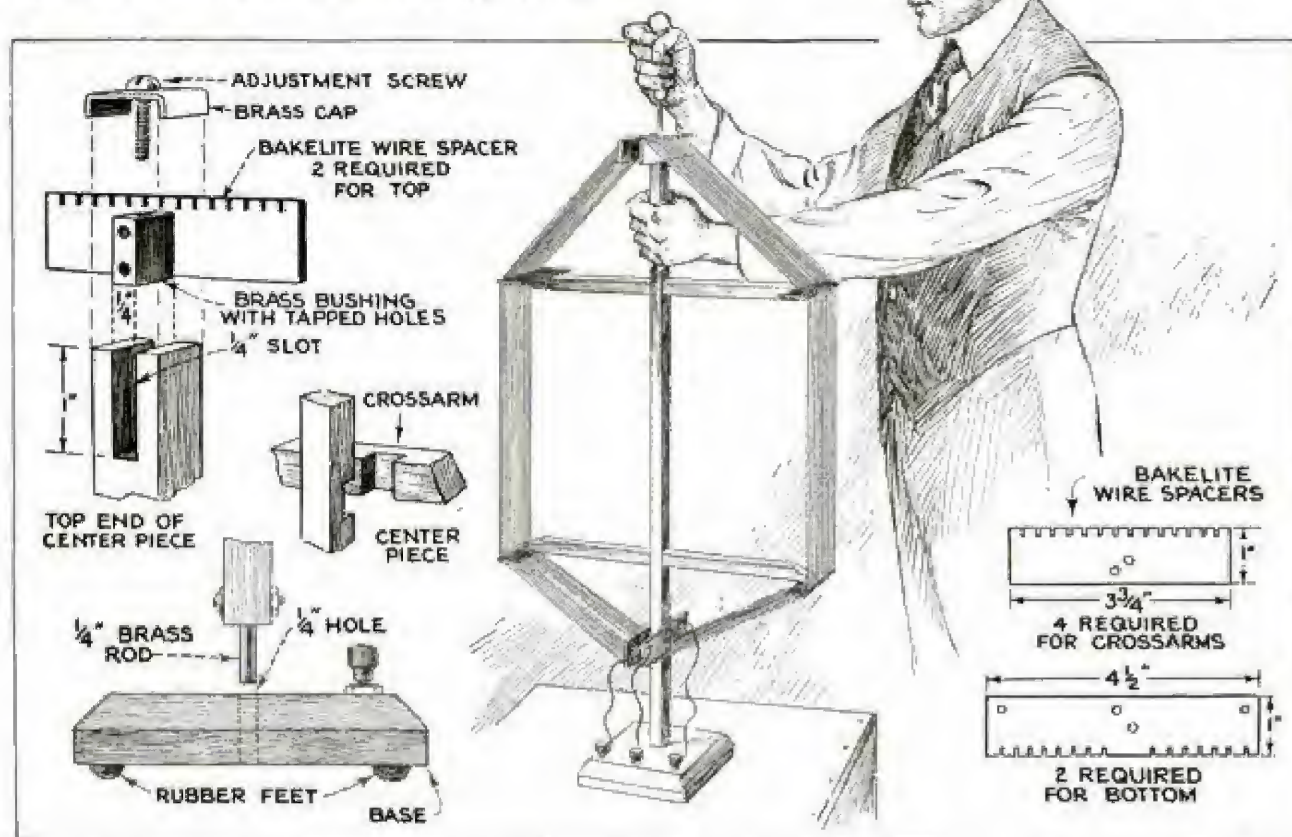


Twin-Tube Adapter, and Sketches Showing the Three Steps in Its Installation

*112, 171, 210, 250 tubes
1775 B. H. Carey*

A Loop-Wire Tightener

The wire on a loop soon becomes loose, lowering the efficiency of the coil. Details are shown in the drawing for con-



structing a loop on which the wire can always be kept tight and uniformly spaced. The centerpiece, crossarms and base are made from hardwood. In the top of the centerpiece a slot is cut and in the bottom end a hole is drilled and fitted with a brass rod. Then the crossarms and centerpiece are half-lapped, as shown in the drawing, and glued together, forming a flush joint. Drill a hole in the base for the brass rod, and three holes for the binding posts. The frame is now varnished, and as soon as the varnish is dry, the wire spacers, except the topmost two, are fastened with wood screws. These spacers are made from bakelite, and notches, to hold the loop wire, are cut in them with a hacksaw. Use two blades together in the hacksaw. The brass bushing or carrier shown is placed in the slot at the top and the two top wire spacers are fastened to it with short machine screws. This bushing should slide up and down in the slot freely. Next put the brass cap on the end and insert a machine screw through the cap hole into the tapped hole in the brass bushing, as detailed in the drawing.

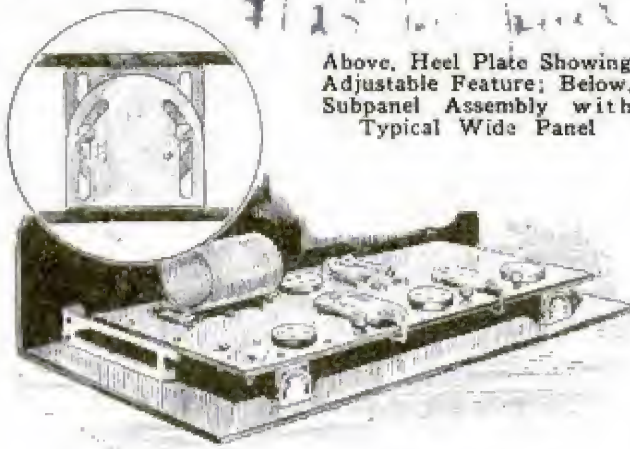
Allow the bushing to rest on the bottom of the slot, then wind the loop wire in the notches on the spacers. These notches are made for 14 turns, this being the correct number for a .0005 condenser. For a .00035 condenser make the spacers long enough for 16 turns. A wire is soldered to the seventh turn and then connected to the center binding post. If the loop gets slack, tighten it by turning the screw so that the bushing carrying the top spacers will slide upward. All stock for the frame is $\frac{3}{4}$ -in. square; the upright is $27\frac{1}{2}$ in. long over all, and the crossarms $14\frac{1}{4}$ in. Space the upper arm 6 in. from the top, and the lower one 3 in. from the bottom.

Testing Filter Condensers

When testing filter condensers in a power device, use a pair of headphones in series with a dry cell. One click should be heard when the circuit is completed to the condenser, and successive clicks on the same condenser should be barely audible; on the other hand, if the condenser is broken down, each click will be loud.

Adjustable Subpanel Brackets

With the increasing use of wide subpanels, it is frequently advisable to supply



Above, Heel Plate Showing Adjustable Feature; Below, Subpanel Assembly with Typical Wide Panel

an additional support at the rear of the subpanel. To meet this condition, dowel pins or metal supports of various types have been employed. The illustration shows a new use for the adjustable heel plates supplied with a standard shelf-supporting bracket set. These provide ample auxiliary supports for the projecting sections of the wider subpanels.

Reducing Interference from Farm Lighting Plants

Reducing interference from farm-lighting plants and from gasoline-electric generating stations in isolated communities has been a subject of considerable research, as well as cut-and-try methods which sometimes help and often fail. The ordinary causes are: spark at distributor, engine-plug sparks, sparks in relays and control apparatus, sparking commutator of generator and noises produced by the various appliances which are connected to the load. In the case of relay and switch contacts, interference can be successfully prevented by shunting the contacts with a 1-mfd. condenser and a 50-ohm resistance. Generator commutators may be shunted by two 2 or 4-mfd. filter condensers connected in series, with

the mid-point between the condensers grounded. There are several interference filters of this type now on the market. The center point of the filter unit being grounded, any high-frequency current generated will be grounded, preventing radiation from the electric wiring. Interference from both low and high-tension wiring may be reduced by proper shielding. As disturbance from spark plugs is greater on some wavelengths than on others, the wavelength or frequency of the disturbance may be changed by adding a shielded choke coil in series with the shielded spark-plug lead at the plug. This coil may consist of a few turns of No. 16 wire wound on a 1½-in. form, and the coil may be inclosed in a small metal can.

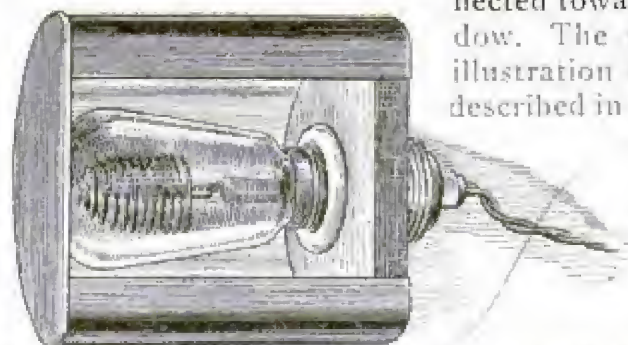
Placing the Loud Speaker

The proper location of the set and loud speaker has much to do with obtaining quality reproduction. A reasonable volume is necessary for good reproduction, and it is not a good plan to cut down this volume as it automatically lowers the quality of the speaker output. If the set is of the console type with built-in speaker, the instrument should be located in a room adjacent to that in which the listener is seated. Do not place the console too near the wall; this also applies to a portable speaker. The latter type should be as far away from the set as possible, and a 25-ft. extension cord may be used for this purpose.

Reflector for the Neon Lamp

The neon lamp, placed behind the scanning disk of the usual television receiver, loses much of its efficiency because the full strength of the light is not focused or re-

flected toward the observation window. The reflector shown in the illustration is a manufactured type described in a Danish radio publication. A similar reflector may easily be made of tin or other bright metal bent to the form indicated. It will add greatly to the brilliancy of the illuminated field.



Above, Neon Lamp with Reflector for Directing the Light onto the Observation Window

Popular Lady
Magazine Copenhagen

Radio; Past, Present and Future

1924



Remember 'Way Back When the Set Shown in the Upper Left Was the Ne Plus Ultra in Receivers? And When We Got the Bread-Board Layout Shown in the Next Picture? It's Quite a Step from the Set Shown for 1922 to the Modern Receiver Below. In 1930, Will the Feminine Football Fan See Her Hero as She Listens to the Broadcast of the Game?

High-Voltage By-Pass Condensers

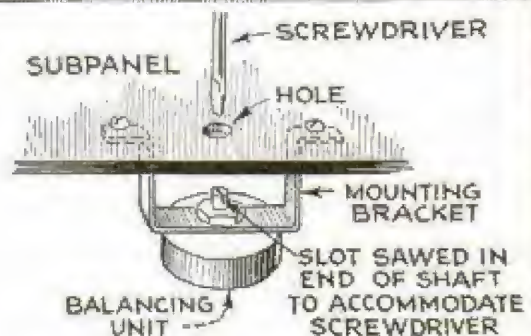
By-pass condensers of high capacity, such as are shunted across the high-voltage battery terminals or used in similar manner for by-pass work, are usually capable of standing up under a pressure of about 300 volts. Occasionally it is necessary to apply a higher voltage and, in this

case, it is possible to double the safe working voltage of the condensers by connecting two of them in series. This, however, will have the effect of reducing the effective capacity to half the original value if the condensers are alike. If a large and a small condenser are connected in series, the combined capacity is always less than the value of the smaller condenser.

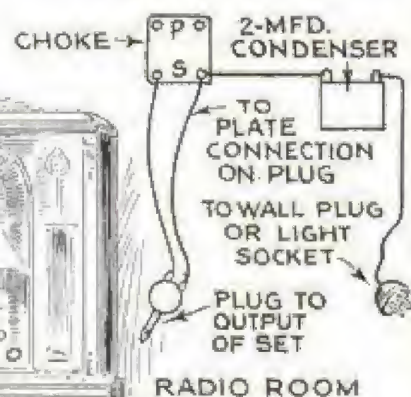
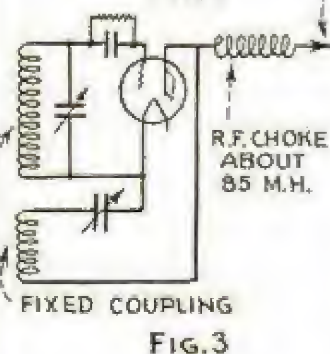
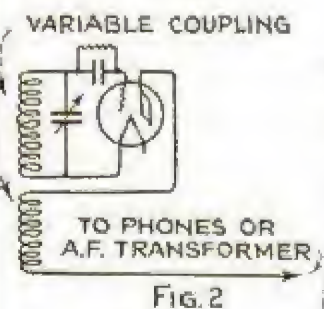
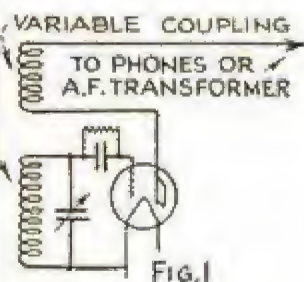
Tips Radio



Above, Wood Subpanels Elevated by Wooden Cleats at Each End Allow Wiring to Be Hidden Below and Also Provide Room for Mounting By-Pass Condensers; the Front Panel Is Easily Mounted with Wood Screws without the Aid of Metal Brackets



Above, Balancing Condensers May Be Mounted below the Subpanel to Prevent Tampering and the Hole Above Sealed After the Unit Is Adjusted for Best Results



Left, Three Methods of Regeneration; Fig. 1 Shows Commonly Used Three-Circuit Tuner, Tickler Coil at High Potential End of Secondary; When Varied with Respect to Secondary, Mutual Inductance Alters Secondary Tuning Independent of Condenser Setting, So That Stations Tune at Various Points, Thus Preventing Logging; Fig. 2, Tickler at Low Potential End of Secondary Does Not Affect Tuning; Fig. 3, Best Plan; Smoother Regeneration Controlled by Lower Variable Condenser, and Set May Be Accurately Logged; Right, Extending Rheostat Range by Adding Fixed Resistor



from the Laboratory



Above, a Simple Adjustable-Voltage B-Eliminator to Be Described in an Early Issue; Below, Coil-Mounting Plugs Made from Prongs of Discarded Tubes; a Hot Iron Is Applied to the Prongs to Remove the Wire and Solder; Mount as Shown

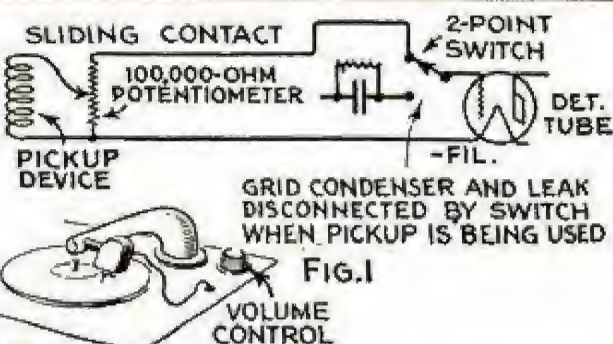
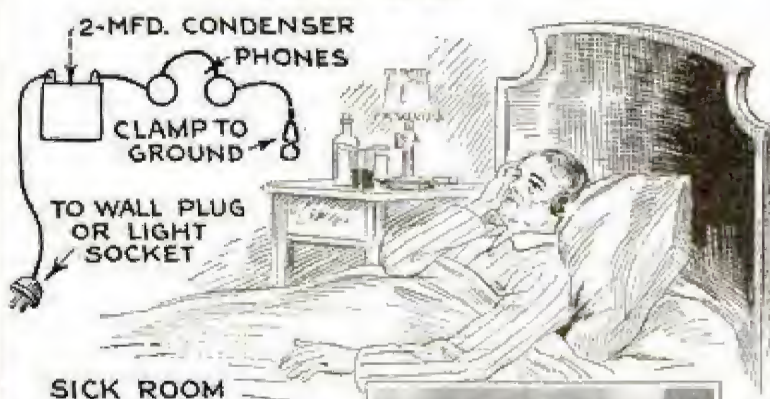
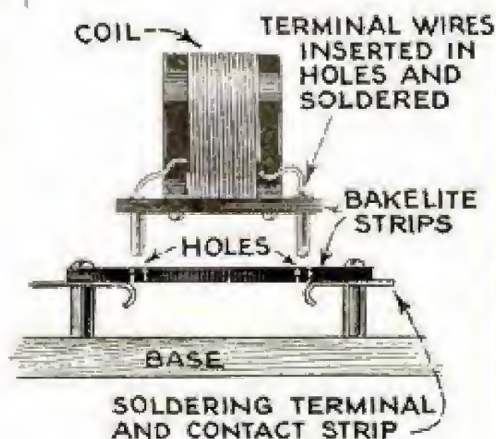
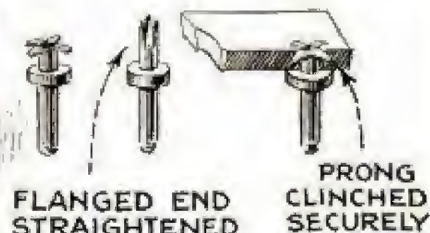


FIG. 2

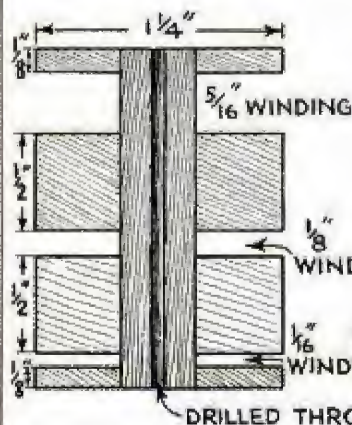
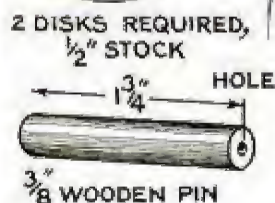
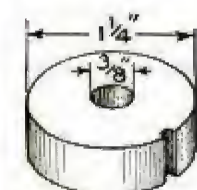
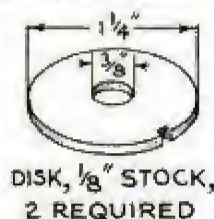
Above, a Handy Volume Control for Phonograph Pick-Up; Switch, Fig. 1, Provides Quick Connection Directly to Detector-Tube Grid; Fig. 2, Control Unit Conveniently Mounted



Housewiring Carries Program to Remote Room; One Light Wire Is Used; Choke Is Secondary of Audio Transformer: See Opposite Page



Above, a Handy Tool for Quickly Countersinking Screw Holes in Panels May Be Made from a Screwdriver; Heat and Flatten the End to the Desired Width, Then Grind to a Point and Sharpen the Edges; This Tool Also Makes a Handy Scriber and Center Punch; Left, a Tapered Reamer Is a Necessary Tool for the Set Builder When Large Holes Are Required, as a Small Hole May Be Quickly Enlarged to the Desired Size; Metal Washers of Various Sizes Placed on Reamer Make Handy Stops



Number 34 Enameled Wire Is Wound on the Bobbin, the Small Section End to Be Connected to the R.F. Side of the Circuit; the Inductance Is About 60 Millihenrys, Effective from 20 to above 550 Meters



The Wooden Bobbins May Be Turned on a Lathe or Built Up from Disks, as Shown at the Left; Then Wound Either by Hand, Lathe, or by Mounting a Hand Drill in a Vise

Homemade R.F. Choke Coils Are Not Difficult to Wind, and Greater R.F. Amplification May Be Obtained through Their Use in Any Broadcast Receiver Limited by Excessive Regeneration or Feed-Back Action in the R. F. Amplifier. A Certain Amount of Regeneration Is Necessary, but Too Much Causes the Amplifier to Go into Oscillation, Which Is Detrimental to Good Results. This Tendency toward Excessive Regeneration May Be Prevented by Shielding the R.F. Stages, and Also by Controlling the Grid Bias to the Tubes, or by Inserting Resistance in Each Tube Circuit. The Choke-Coil Method Accomplishes the Same Result More Efficiently by Separating the R.F. Stages. The Fact That the Plate Circuits of These Tubes Are Supplied by the B-Battery Common to All the Tubes, Is a Source of Resistance Coupling between the Tubes of the Amplifier if R.F. Current Is Permitted to Pass through This Battery. The R.F. Choke Coils Prevent the R.F. Current from Flowing through the Common B-Battery, Thus Reducing Resistance Coupling with Its Regenerative Tendencies. The R.F. Choke Coil Consists of a Small Inductance Which Has a High Impedance at Radio Frequencies, Retarding the Flow of R.F. Current; the Resistance to the Emission Current of the Tube Is Low so That Little B-Battery Is Wasted across It. The Impedance Offers No Hindrance to Voice

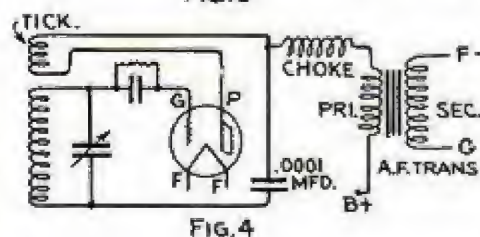
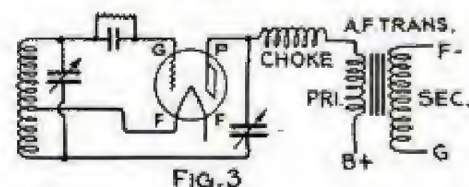
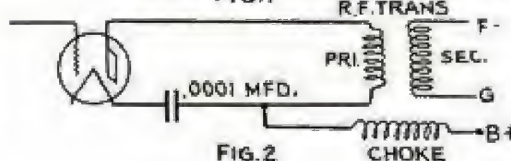
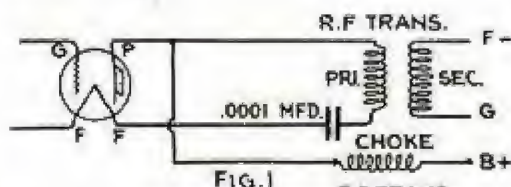
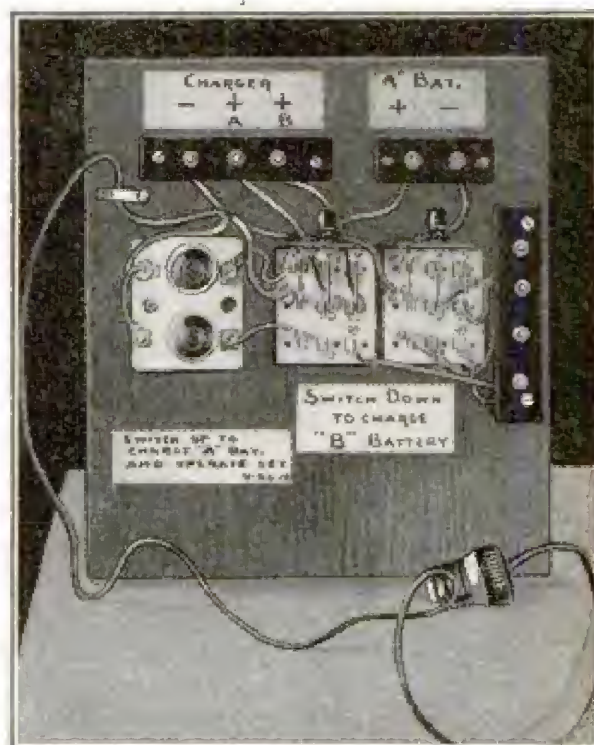
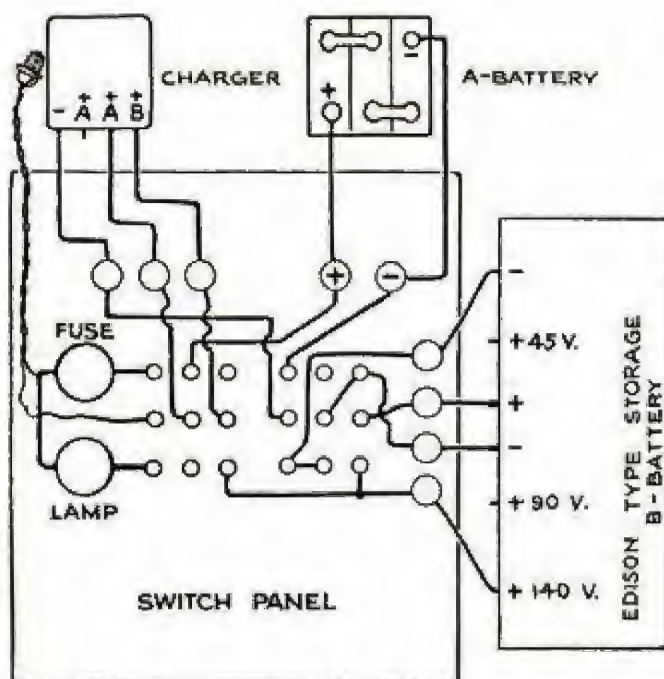


Figure 1 Shows Choke in Plate Circuit of R.F. Tube, Forcing R.F. Current to Pass through the Transformer Primary and Condenser Back to Tube Filament, While the Emission Current Passes through the Choke to B-Battery; Fig. 2 Is Practically the Same Except That Here the Emission Current Passes through the Transformer Primary; Fig. 3 Shows the Choke in a Regenerative Detector Circuit, to Keep R.F. Current Out of Audio Amplifier and B-Battery; the Emission Current of the Tube, Together with the Rectified A.F. Current, Passes through the Choke to the Audio Transformer; Fig. 4 Is Similar but Applied to Tickler-Coil Type



Left, Diagram Showing Panel Connections to Charger and A and B-Batteries; Right, Photo of Completed Charging Panel

Charging Panel for Edison-Type Storage B-Batteries

A charging panel for those who built the Edison-type storage B-battery described in the July, 1928, issue of Popular Mechanics, was made by the writer and found very handy. The wiring diagram and photo clearly show the construction details. With very few alterations the switch-panel may be used for other types of storage batteries. The materials cost about 75 cents and may be obtained from any electrical shop. The parts include a pair of three-pole double-throw knife switches, a two-socket fuse block or two lamp sockets, nine binding posts, a few feet of lamp cord with a plug, and some flexible wire for the various connections. The panel is designed for use with chargers that require an incandescent lamp as a charging resistance and the changing of terminal wires when charging B-batteries. The plug connected to the board is screwed into the charger fuse receptacle, and the fuse is transferred to one of the sockets. With the switches thrown up, the batteries are connected for set operation, and the charger is connected for charging the A-battery when desired. When the switches are thrown down, the two units of the Edison-type B-battery are con-

nected in parallel for charging.—Walter E. Burton, Kenmore, Ohio.

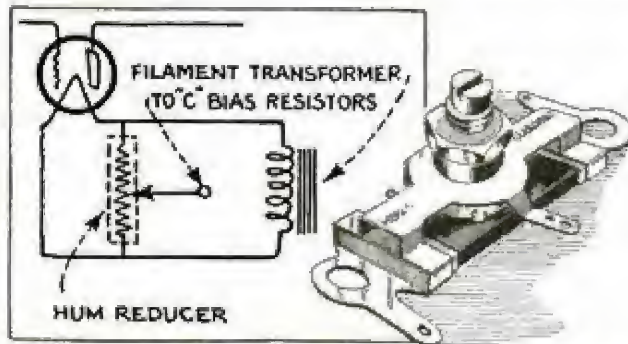
FOR THE RADIO BUILDER

The simplified blueprints listed below include the best of Popular Mechanics tested circuits. When ordering, simply quote the numbers of the blueprints desired and inclose the proper amount in an envelope addressed to Popular Mechanics Magazine, Radio Dept., 200 E. Ontario St., Chicago, Ill. Back magazines containing full descriptions of the circuits can also be obtained. Inclose an additional 25 cents for each magazine desired, giving date of publication.

- | | | |
|--|------------|-----|
| No. 111, Homemade Tube Tester | July 1926 | 25c |
| No. 115, 15 to 550-Meter Three-Tube Receiver | Nov. 1926 | 25c |
| No. 116, Three-Tube Loop Set | Dec. 1926 | 25c |
| No. 117, Simple Electrolytic B-Eliminator | Feb. 1927 | 25c |
| No. 123, Economy-Nine Superheterodyne | Nov. 1927 | 50c |
| No. 126, Homemade B-Battery and Charger | Jan. 1928 | 25c |
| No. 130, One-Tube Short-Wave Adapter | Mar. 1928 | 25c |
| No. 131, Five-Tube All-Electric Receiver | Apr. 1928 | 25c |
| No. 134, Edison Type B-Battery | July 1928 | 25c |
| No. 135, Screen-Grid Browning-Drake Receiver | Sept. 1928 | 25c |
| No. 138, Screen-Grid Perfect-Tone Six Receiver | Nov. 1928 | 25c |
| No. 139, Simple Television Receiver | Dec. 1928 | 25c |
| No. 140, Power Amplifier and B-Supply for Television | Jan. 1929 | 25c |
| No. 141, Hammarlund-Roberts Hi-Q 29 Junior A.C. Receiver | Feb. 1929 | 25c |
| No. 142, Two-Tube Screen-Grid Short-Wave Adapter | Mar. 1929 | 25c |
| No. 143, Four-Tube Screen-Grid Receiver | May 1929 | 25c |

New Hum-Control Unit

A compact adjustable center-tap resistance for controlling hum in a.c. sets is now

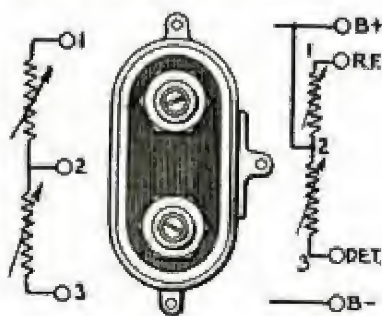


Hum Reducer, Showing Simple Connections across Filament Winding of Transformer

available. There is no longer any question regarding the advantages of the center-tap resistance method over the center-tap transformer winding in the operation of filament type a.c. tubes. The little device shown herewith may be mounted on a panel or subpanel by means of a single hole or on a baseboard by wood screws through holes in the end lugs. Connections are made to the three soldering tabs. The standard resistance value for the usual a.c. tube circuit is 30 ohms, but other resistance values are available within a range of 6 to 500. The main application of the unit is as a center-tap grid return for a.c. filament tubes, providing a simple means of compensating for circuit and filament unbalance.

Double Resistor Saves Space

A compact multiple variable resistance comprising two separate resistances, adjustable to any desired value, and contained in a stout metal case, is now available.



Two holes are necessary for mounting the unit on the panel or subpanel and adjustments are made with an ordinary screwdriver. The wiring diagram shows three terminals, 1 and 3 representing the outside terminals, and 2 the center terminal between the two resistors. The dia-

gram at the left shows two separate and distinct variable resistors with a common terminal, while the diagram at the right shows a resistance network with two variable voltage taps, simplifying the usual output circuit of a radio power unit. The device, when used in parallel, greatly increases current-handling capacity; it may also be used as a potentiometer or balancing resistance, with variable total resistance and variable mid-point to meet any circuit condition.

Selectivity with One Dial

The amateur, when making a single-dial set, generally imagines that the job is done when he puts all his condensers on the same shaft. However, while it is an easy matter to adjust the r.f. stages to the same resonance point, the antenna circuit is difficult to keep in tune, with the result that the set suffers a loss in both selectivity and volume. Many makeshifts have been devised to overcome this defect, but the simplest, and probably the best, is a trimming condenser, connected across the antenna-tuning condenser and controlled from the front panel.

Automatic Dynamic-Speaker Control

A new automatic control for the dynamic speaker is shown in the accompanying illustration. The device contains a thermostatic switch which automatically connects the speaker when the set switch is thrown. It also disconnects the speaker when the set is turned off, thus preventing current being left on the speaker when the set is not in use. The device is plugged into the usual wall socket, and the set and speaker into the designated receptacles, no wiring changes being necessary.



■ A hissing tube or one that causes sharp clicks may be improved by gently thumping or shaking it when the filament is heated; the trouble is caused by the filament touching the grid element.

AMATEUR MECHANICS



Golf in Your Own Backyard

By SAM BROWN,

*157 Carhart St
Marion, Ohio*

FOR SOME reason or other, many people associate golf with men of such occupations that their office hours are from late morning to early afternoon; they never consider the excellent sport in this game as something which they can enjoy themselves.

But why not? Two or three clubs and a course that you can lay out yourself, and there you are. Of course, you may not have the technique of a Hagen, Jones or Barnes, but in your own way you can

laid out in a pasture or large vacant lot if you live in the country or suburbs; but if not, then your own backyard can be converted into something quite "golfy." Get a number of tin cans of the variety which come with lids. Dig a few holes here and there and plant your tin cans in these, patting the dirt down smoothly around each hole.

In the relative arrangement of these cans, you must exercise your ingenuity by



The Holes for Putting Practice in the Backyard Course Are Tin Cans, Buried in the Ground, and Covered with the Lids When Not in Use

get much fine sport and exercise out of the game in this fashion.

First of all, the course: This can be





Excellent Practice in Driving Is Obtained with a Target Fastened in the Garage Doorway, the Placing of the Shots on the Target Being Used to Determine Where the Ball Is to Be Placed for Putting

placing them so as to take advantage of natural hazards in the shape of streams of water, clumps of low trees, etc. In one vacant-lot "club," the course is composed of five holes, spaced at from 125 to 200 yd. apart, and in the complete round the player must drive over a small stream of water twice, as well as skirt three areas of low timber. It is not likely that your golf site will duplicate this arrangement, but by taking advantage of the natural lay of the ground in the placement of your holes, you can readily map out something equally good or better.

Small homemade flags should be used to designate each hole, as the drive from one hole to another would be impossible if there were not some form of marker at which to direct the ball. The lids of the cans should be put in place when the course is not in use in order to keep the holes clean and water-tight.

Lacking the pasture or

large lot, the amateur golfer can lay out an equally sport-giving course in his own backyard; and all this without disturbing the position of the garden or the wife's rose bushes.

The procedure, however, differs somewhat. The average backyard can easily accommodate two or more of the tin-can holes described before, but due to the

limitations of the ground these are only available for putting. If you wish something at which to drive, a large stretch of canvas (the fly from a tent does the trick nicely) can be painted with a target and hung in the door of the garage. The manner of using this target is as follows: Tee up your ball about 10 ft. back, after having dipped it lightly into some white chalk or flour, which you should keep conveniently placed in a small can. Let

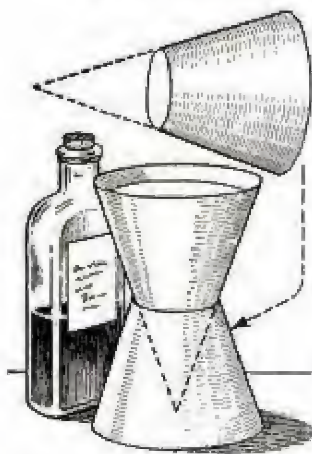


drive! Your ball will zoom forward, smack into the canvas (a miss being almost impossible), and the white powder on the ball will leave its mark on the target. A direct hit entitles you to place your ball at a certain point on the two or three-hole course, readily accessible to holing out in one or two shots, while poorer hits place the ball in more difficult approaches. For a complete miss of the target or ball, a sand trap consisting of a box of sand can be used, and the ball buried halfway in this.

After completing the first hole, the drive for the second hole may be made, or, if desired, the complete two or three-hole course can be played with but one drive, the succeeding holes being made in the usual putting manner. It is golf on a small scale, certainly, but with care in placing the holes so that they can be played in various manners, the sport becomes something almost equal to that played on the full-sized links, and it affords splendid practice.

As to the clubs used to play these miniature courses, two are sufficient. These should be a driver and a putter, and any sporting-goods store can furnish you with inexpensive yet serviceable clubs for as little as \$1.25 each. Other clubs, especially a brassie, may be added if your pocketbook allows, but these are not absolutely essential, since the two clubs mentioned will take care of almost any shot which can be laid out in these miniature links.

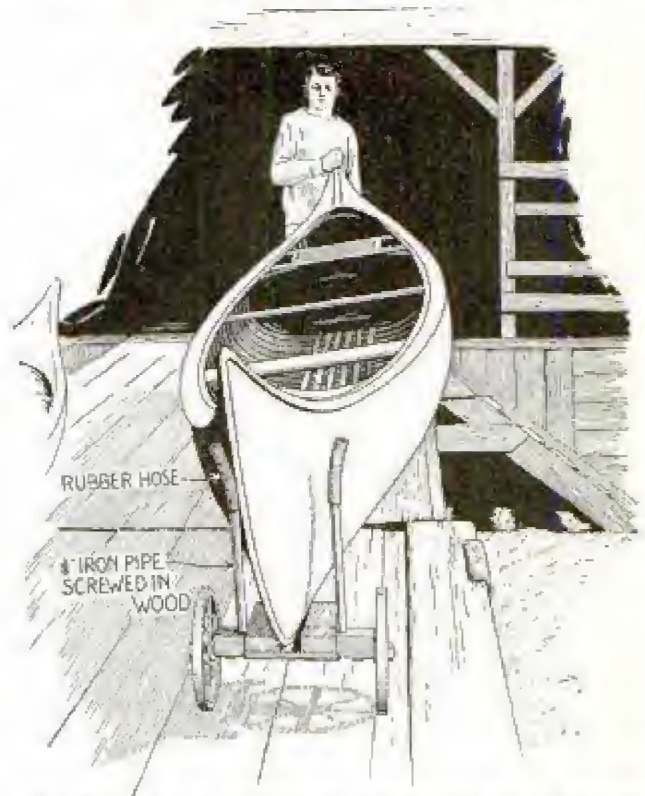
Holder for Conical Paper Cup



the top opening. This has been found valuable also in administering medicine.

It is often rather inconvenient to use conical paper cups, as they cannot be set down when filled with liquid. This difficulty can readily be overcome by cutting off the end of another cup, setting it upside down on the table and then placing the filled cup into

Serviceable Canoe Jig for Boat House



Two-Wheeled Jig Facilitates Transportation of Canoes in Boat House

For running canoes in and out of a boat house, it will be hard to beat the illustrated jig. It has been in use at a shore resort in Connecticut and has given complete satisfaction under rough usage. It consists of a wooden frame mounted on two cart wheels. Two lengths of iron pipe are set vertically in the frame, the tops being bent outward a trifle and covered with lengths of rubber hose, as indicated. In use, the bow of a canoe is set loosely on the jig between the pipe supports, the keel fitting in a slot cut to receive it. By tipping the opposite end of the canoe when transporting it, the jig can readily be steered. As it is small, the jig can be hung overhead within easy reach. The rubber bumpers on the ends of the pipe supports prevent marring the canoes. The construction details are plainly indicated in the drawing.—Henry S. Laraby, New Haven, Conn.

¶If you have to pour gasoline into your tank and have no funnel at hand, take a short piece of inner tube, stuff one end into the tank and have someone hold the other end open so that you can pour in the gasoline.



Eyeshade for Reflecting Type of Camera Enables User to Work with Greater Speed

Eyeshade for Reflecting Cameras

Efficient use of the reflecting type of camera is largely dependent on complete darkening of the hood when focusing. In years of practice, I have sought some method of obtaining instant and complete darkness within the hood, and after various trials and errors, I developed the eyeshade shown in the illustration. It works so well that it has enabled me to take pictures in much less time than is usually required. When not in use, the eyeshade is worn tipped back on the head and thus is easily brought down.—John Edwin Hogg, Honolulu, H. I.

Tape Repair for Garden Hose

To cut out the bad portion of a garden hose and then connect the two good ends by a sleeve to which they are securely held by means of clamps, is good practice in case of a very bad break or cut, but not for the numerous leaks of an old hose. For a few cents, enough material can be had to make repairs that will stop the leaks and make the hose last a long time. Get a roll of ordinary electricians' friction tape, a tube of tire-patching cement and some thin rubber, from toy balloons, for example. The leaky place on the hose is first wiped clean, and a piece of rubber

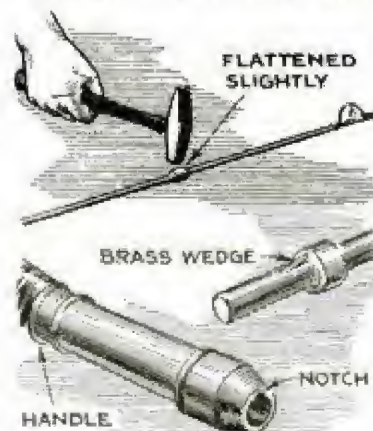
is cut or torn to fit over the bad spot. Both the patch and the surface of the hose where the patch is to be applied are given an application of the cement, which must be allowed to become apparently dry before the cemented surfaces are put together. After the patch has been put on, wrap tape around the repaired section of the hose. Shellac or ordinary paint applied to the tape will prevent it from becoming loose.

Mouse-Proof Desk Drawer

When looking through the lower drawer of my desk for a manuscript, I found that a mouse had gnawed a hole in it and begun to build a nest, using some of my manuscripts as material. Fortunately, much damage had not been done, and I at once took steps to prevent the mouse from entering again. To this end, I tilted the desk so that the bottom was exposed and tacked a piece of fly screen over the whole underside. This proved entirely satisfactory, as it could not be seen, did not interfere with the movement of the drawers, and effectively kept the mice out.—H. H. Siegele, Emporia, Kans.

Keeping Casting-Rod Guides in Line

When bait-casting with a steel rod, I had trouble in keeping the guides in line, so I flattened the brass joints slightly by tapping them with a hammer. The joint between the handle and the first guide is



not flattened, however. A better method is to notch the inside of the handle with a file, as shown in the lower detail, and to solder a short piece of wire or a strip of brass, about the length of a

shingle nail, to the end of the first section to fit the notch. When soldering, care must be taken not to hold the iron on the soldered seam so long that it will loosen.—Adolph Reiter, Marinette, Wis.

Reiter,
P. O. #1, Box 272

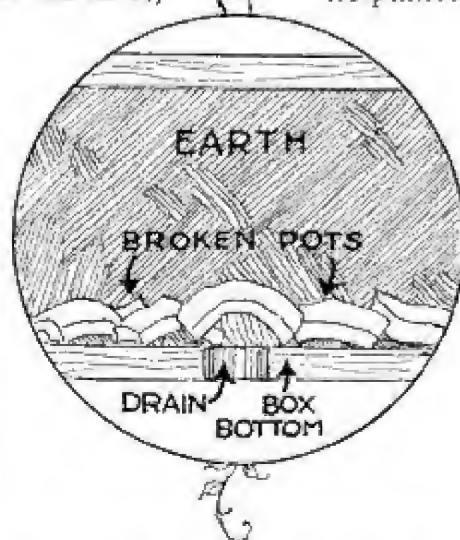


THERE are very few rules necessary to remember for the successful growing of plants in window boxes, but neglect of the simple rules leads invariably to failure. Many people, for example, think that the ne plus ultra in window or flower boxes is a discarded water tank, cut in half and filled with any old earth. Aside from the questionable taste exercised in the selection of such a receptacle, it is really a miracle that flowers are able to grow at all in it, for no provision is ever made for drainage, and without drainage, the soil becomes waterlogged and sour, and plants, if they grow at all, grow feebly and are never healthy.

The window box should seldom be deeper than 9 in., about 12 in. wide, and as long as necessary, although, unless it is to be a permanent part of the house structure, the amateur gardener will find that a 3-ft. box is about as long as he can handle with comfort. Do not make the box too narrow, which seems to be necessary sometimes to fit a scanty window sill. A narrow box, or one that is too shallow, will not hold enough earth, and will require much more frequent watering than it is apt to get, with the

consequence that the plants are always on the verge of dying for want of water. The first rule, therefore, is to leave plenty of room for the soil, even if it is necessary to go to some trouble in providing a suitable support for the box.

Second is the matter of drainage. One man who had trouble with a large window box, running across the front of the house, found that his plants were always feeble, and when he planted bulbs in the fall, for spring flowering, that the bulbs were always rotted in the spring, and produced no flowers. He called in a gardener, who, after looking the box over, told him that the whole trouble was lack of drainage. "How can that be?" said the owner, "I filled the bottom of the box with broken flowerpots!" Many amateurs seem to have the same idea, that the presence of a few broken pieces of pots has



the magical property of providing adequate drainage. The broken pottery has a very valuable use, but it is not that of providing drainage; it is of protecting the drainage. Through the bottom of your

boxes, drill some 1-in. holes, right through the wood, and through the metal, if the box is

A LINE to the Amateur Mechanics department, Popular Mechanics Magazine, will bring you a list that will help you in selecting plants for your window boxes.



zinc-lined. Over these holes, place broken pieces of flowerpots, as shown in the illustration. The holes provide the drainage for excess water, and the broken pots keep the holes from being stopped up by particles of soil and trash washed into them. That is all there is to it. The hole in the bottom of an ordinary flowerpot should be covered with a broken piece of pottery for the same reason.

Use good soil. If there is none in your immediate neighborhood suitable for use, go to the florist and buy enough to fill the box. Flowers will not grow in clay or ashes. Having obtained the soil, keep its quality up by occasional fertilizing, remembering that soil cannot be allowed to remain in the same state for years without losing its fertility. Bonemeal, liberally spaded in, is about as good a window-box fertilizer as any, although, for quick results, any good commercial fertilizer sold for flower gardens may be used with excellent results. Feed the soil, so that it can feed the plants.

When you water, drench the plants. Two good drenchings every week are better

than a dribble of water every day. There are some good types of "self-watering" boxes on the market that minimize the attention required, but it does not take much time to give the boxes a thorough watering twice a week, in hot weather. If a box is large enough, it will be found that, in many cases, once a week is enough. A little hint, in this connection: Where a box rests on the sill, and is not supported by brackets, elevate it a little above the sill on a couple of strips of wood. If the bottom of the box rests directly on the sill, it quickly rots.

Lastly, do not keep flowers on the north or shady side of the house that are suitable for use only in sunny locations. Some flowers will not grow in the shade. A postcard dropped to Amateur Mechanics department will bring you a list of flowers suitable for use in sunny and shady locations.

A simple and attractive method of handling the flower problem in a house that has an iron balcony is shown in one of the accompanying illustrations. Ordinary flowerpots are used, hung in wire or flat-iron rings fastened to the balcony rail. The dull red of the pots is very attractive, and the flowers grow well.

Easily Made Wood-Bit Extension

A wood-bit extension is often needed unexpectedly and if you do not carry one in your tool kit, quite a delay may be caused in getting one. However, you can

easily improvise an extension from a length of $\frac{1}{4}$ -in. pipe. Take a hacksaw and split the pipe at one end for about 1 in. Repeat this operation by making another split at right angles to the first one. You will then have four grooves for the bit shank to fit in, the latter being pressed firmly into place so that its own weight will not cause it to slip out



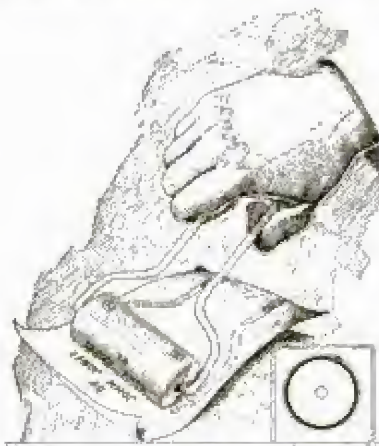
again. The other end of the pipe is split for several inches and the halves are bent down to form a handle. The writer has found it necessary to resort to this makeshift several times and has found it entirely satisfactory.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

Mucilage Stops Leak in Gas Connection

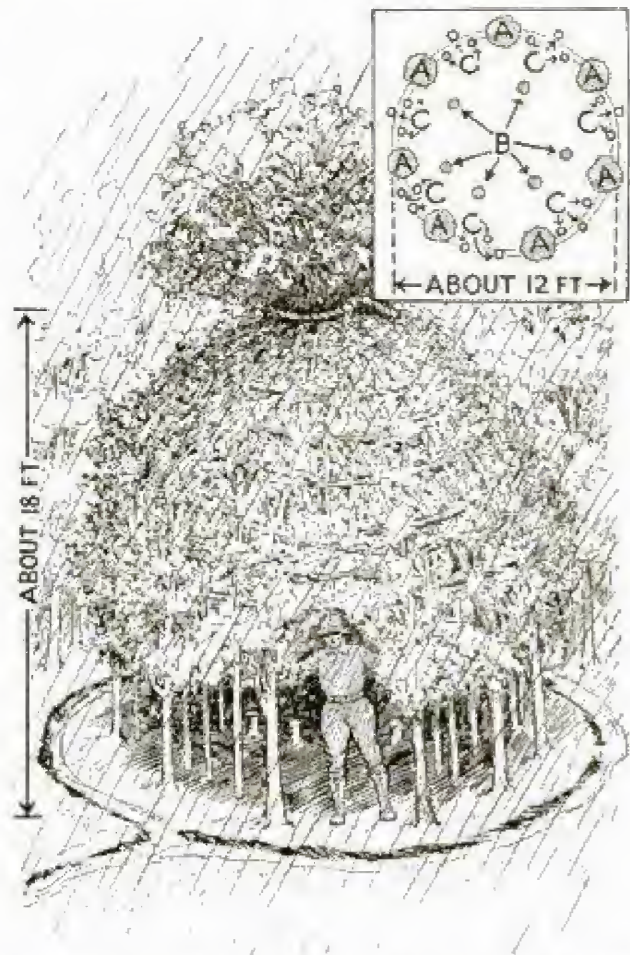
A leak started in the ground-joint connection between the gasoline-supply pipe and the carburetor on my automobile. It was in a place where it could not be re-ground easily, although I tried to stop it in this manner. Soap and other lubricants were used to no avail. The thought came to me that some liquid which gasoline would not dissolve might do, and I used a small portion of old mucilage which had become thick, applying it to the connection and letting it stand to harden, then screwing the joint together. This stopped the leak effectively.—Bert H. Stanley, Portage, Wash.

Homemade Rotary Stamp

For addressing tags, envelopes, etc., a simple rotary stamp can be made from a small spool with the flanges removed, a length of heavy galvanized-iron wire, with the ends bent to fit into the hole of the spool as indicated, serving as a handle. Cut a strip of felt from an old hat and



wrap it tightly around the cylinder, tacking the ends down. This is the inking pad and over it a sheet of stencil paper is wrapped. The stencil is, of course, prepared on a typewriter or by means of a stylus if a typewriter is not available. Thumbtacks are used to hold the edges of the stencil to the cylinder, which permits its removal for reinking the pad. However, a large number of copies can be made before this is necessary.—Harry Frye, Tullahoma, Tenn.



Rainproof Inclosure for the Camp Made from a Number of Saplings Which Are Tied Together as Shown

Rainproof Inclosure Made from Saplings

In the absence of a tent, a simple and effective rainproof inclosure for the camper can be made from a cluster of saplings as shown in the illustration. A length of rope and a hatchet are all that is required to do the work, so that the cost of the inclosure is merely the labor in building it. Choose a well-drained site, covered thickly with suitable saplings. The inner ones are removed and the outer ones tied together near the top. Pine or cedar limbs are hooked on the outside, point downward, to shed the rain better.—Paul Berry, Birmingham, Ala.

Holding Films for Drying

For suspending films to dry in a room brass "O. K." paper fasteners have been found satisfactory. A strong twine, stretched across the room, will hold a large number of rolls or packs. The fasteners have a good grip, are too small to damage the film, and will not leave rusty marks.—George Parke, Chicago.

Simple Homemade Check Protector

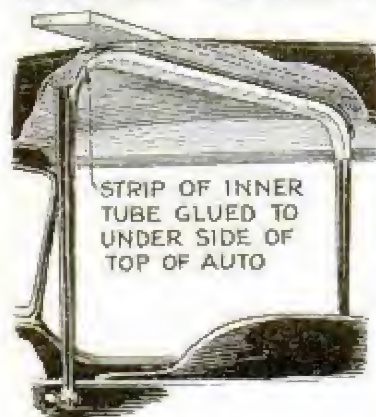


Deeply Knurled Steel Disk, Attached to Dating-Stamp Handle, Makes Good Check Protector

This check protector consists of a knurled steel disk about the size of a nickel. The knurl should be deep so that the diamonds will project as sharp points. Mount the disk on the handle of a dating stamp, as shown in the drawing, using a small brass pin to retain it. In use, the check is laid on a blotter and the disk rolled over it. This, of course, should not be done until after the ink has thoroughly dried.—G. A. Luers, Washington, D. C.

Wear on Touring-Car Top Prevented with Rubber Strip

Touring-car tops show the first signs of wear at points over the crossbows. I have found that such wear can be eliminated to a great extent by gluing a strip of rubber, cut from a discarded inner tube, to the underside of the top, at points where the latter makes contact with the



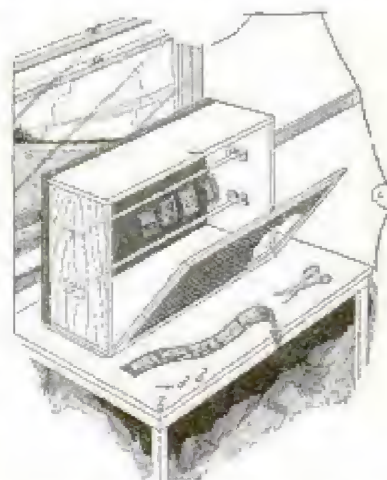
crossbow, as shown in the illustration. Rubber cement is, of course, used for this purpose. The strip should be about 2 in. wide and a trifle longer than the bow. The glue is applied to both strip and top, and is allowed to become apparently dry, after which the strip is applied. A length of 1 by 4-in. wood is used to press the strip firmly against the top without risk of puncturing the latter.—Louis B. Jones, Augusta, Ga.

Novel Washbasin for Camp

One camper found that the crown of an old felt hat can be used as a washbasin if it is saturated with paraffin. This is done by soaking it with a mixture of one part of melted paraffin and four parts of gasoline. When filled with cold water, this container is literally as stiff as a board. Before packing it away, it may be warmed up for a few seconds before a fire, to soften the paraffin so that the hat can be rolled into a small cone.

Cabinet for Drying Films and Prints

To dry films and prints in a short time without using special machinery, they are often exposed to a strong draft of clean air. This can be done by placing the films near an open window or by using an electric fan to direct a current of air against them. With these methods, however, dust particles are likely to settle on the gelatine and will show in the prints as fine, white spots. Another disadvantage is that many small insects may be caught on the film. All this can be avoided by inclosing the films, or prints in a cabinet like that in the drawing. The front and back are layers of fine gauze, which allows the air to sweep through unhindered, yet excludes dust and insects. For the frame a stout box can be used, after

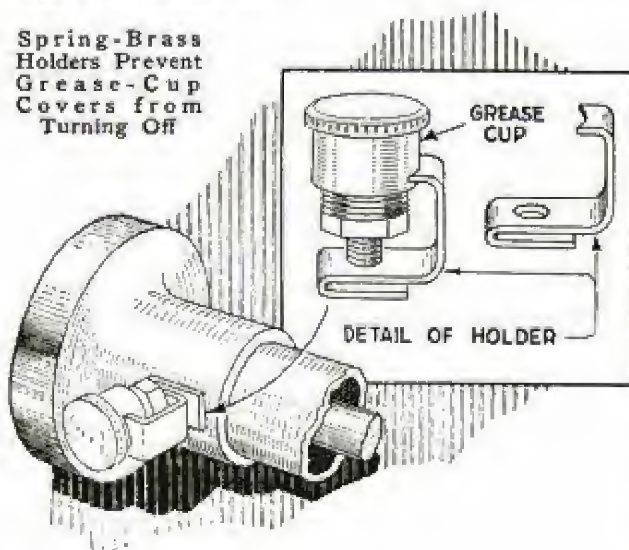


2355 Richmond Place. N.Y.

the lid and bottom are removed. If a box of suitable dimensions is not available, one can be made from four boards. To the front of the cabinet a cover is hinged, so that it will lie down flat on top of the table or other surface on which the cabinet is placed. It may be necessary to raise the cabinet slightly by fitting a strip of wood under each side to let the cover lie perfectly horizontal. The cover is also provided with a pin and catch to hold it in the closed position. Gauze is then tacked over it and also over the open back. If the mesh of the gauze is not fine enough, fold the gauze double. The films or prints are suspended from small metal clips inside of the cabinet, the clips sliding on brass rods, which are in turn supported by small wooden blocks fitted to the sides of the cabinet. One of the blocks has a hole and the other a slot, like roller-towel holders, to facilitate the insertion and removal of the rods.—C. A. Oldroyd, Barrow-in-Furness, Eng.

Holding Grease-Cup Covers in Place

On engines or other machinery which are subject to strong vibration, grease-cup covers often turn off and are lost. A good method of preventing this trouble is shown in the drawing. Simply get a strip of brass, double it over at the end and drill it to fit the base of the grease-cup shank. Bend the top so that it will bear heavily against the cover when it is in place. Almost any available piece of sheet brass can be used for this purpose, and it takes only a few minutes of spare time to make the holders.



Wooden Mud Shoes



Wooden Mud Shoes Resembling Snowshoes Enable Fast Progress over Marshes

Walking in marshes with ordinary hip-boots proved to be quite tiresome, so I made the mud shoes shown in the drawing. They are constructed of wood and are made to resemble snowshoes. In use, they are strapped to the feet as indicated. The large surface provided in this way prevents the user from sinking into the mire and thus enables him to cover the ground in much less time and with less fatigue than would be possible otherwise. Hunters and trappers who do considerable tramping in marshes will find these shoes a great convenience.—Harrie F. Talbot, Peru, Ill.

Workbench Vibration Stopped

My wife frequently complained of the noise caused by working on my workbench, which was located in the attic. The noise of hammering or of running any of my bench machines could be heard throughout the house. To remedy this trouble, I sawed about 6 in. off each leg of the bench and then set each leg in a crock partly filled with wet sand. This effectively stopped transmission of the vibration to the floor. Wooden boxes would undoubtedly serve the purpose just as well as crocks.—Richard P. Cole, Los Angeles, California.



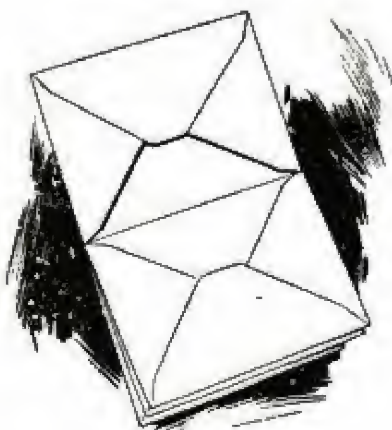
Circular Flower Bed, Built Up in Terrace Formation, Affords Good Display of Flowers

Novel Flower Garden

When space is limited, a small cone-shaped bed like that shown in the drawing will give an excellent display of flowers. It is built up in circular tiers or terraces, the lowermost one being 6 ft. in diameter, the second $4\frac{1}{2}$ ft., the third 3 ft., and the fourth $1\frac{1}{2}$ ft. All are about 12 in. high and are formed from coarse wire mesh, tacked to two hoops, as indicated. Sod is laid against the mesh on the inside and then the interior is filled with rich soil. In course of time, the grass in the sod will completely hide the mesh. —Dale R. Van Horn, Lincoln, Nebr.

How to Make an Envelope Book

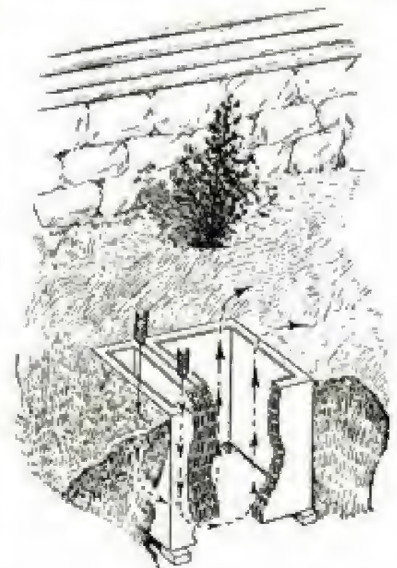
A handy book for keeping bills, receipts or other valuable papers and tickets can be made from a number of unused envelopes. Simply paste or seal together all the flaps of the envelopes, as shown in the drawing. Insert the flaps into another envelope of the same size but stronger and seal the flap of this to the back of the others. Stretch



a rubber band around the book to keep it closed and prevent loss of the contents. —Arthur G. Hultquist, Lake Nebagamon, Wisconsin.

A Waste-Paper Burner

In many places the regulations do not permit paper to be put among the garbage. If placed with ashes or other refuse, the landscape is likely to be marred, as the papers are blown about alleys and back lots. Attempts to burn the paper in the furnace only serve to interfere seriously with the success of the fire, as the ashes of the paper clog up the air space between the coals and thus prevent sufficient draft. Rubbish burners made of material similar to woven-wire fencing are much used, but the ashes and partly burned paper often will escape to be blown about by the wind. For two years, one man has used a rubbish burner that has none of these disadvantages. It consists of a 12 by 15-in. flue, or chimney lining, set in the ground to its full length, as shown in the drawing. The tile rests on half bricks at each corner. These are set back into the ground in order to project only a little beyond the inner surface of the tile. At one side a similar tile, 6 by 12 in. in size, is set. This also rests on bricks, which serve to raise it above the bottom of the hole and thus allow air to enter. The paper is placed in the larger tile. The upper paper is lighted and the fire burns from the top down. The burning takes place slowly and the flame is never high enough to injure objects close at hand. The air passes down the smaller tile through the hole under the two tiles and up the larger one in which the paper is burning. The combustion is perfect and no dense smoke is produced. A cover of



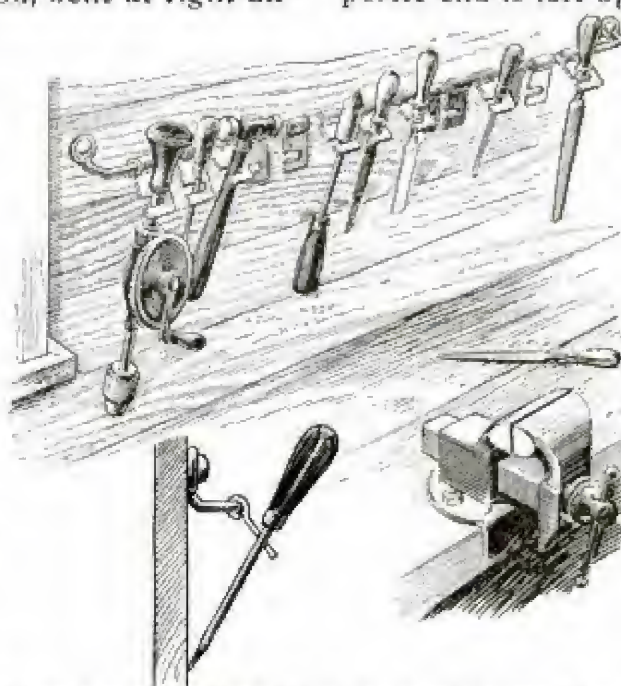
galvanized iron should be placed over it when the burner is not in use. The ash can be allowed to accumulate until the tile is one-third full, without interfering in any way, as long as it does not get wet.

Screen for Amateur Movies

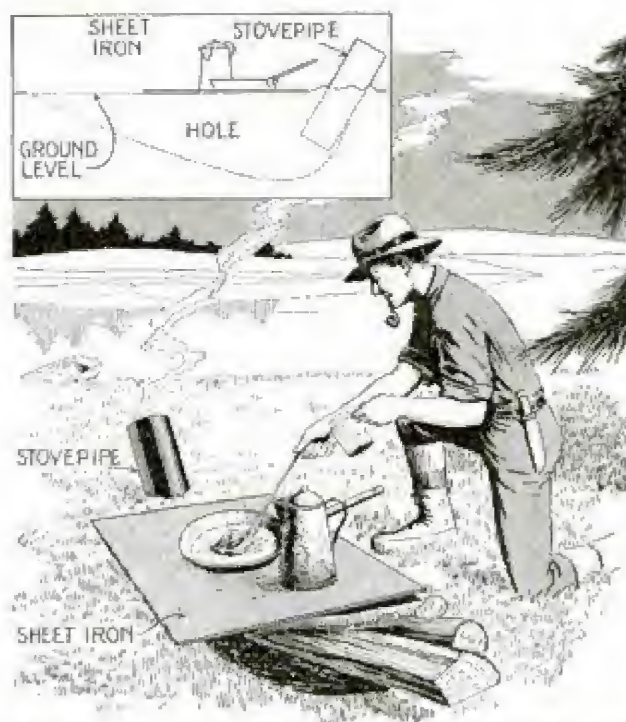
Spectators at amateur movie shows find the best point to view the picture is directly in front of it. This is due to the flat surface of the screen. Professionals use screens with a sanded or rough surface in order to break up direct reflections. A screen of this kind can be made by the amateur by using a heavy window shade coated with a mixture of paint and beads. Flat white paint is best, and the beads should be half white and half transparent glass of very small size. The paint is applied in a heavy coat, and the mixed beads pressed into the wet surface. When dry, the curtain can be fitted into a folding frame or case, or it may be hung on a wall, but in either case it must be absolutely flat when in use. A dark frame should be fitted around the screen to absorb wayward light at the margins.

Rack Holds Tools of Many Shapes

The simple rack shown in the drawing will be found suitable for holding tools of practically any shape. It consists of a length of $\frac{3}{8}$ -in. iron rod, bent at right angles about 3 in. from each end and with eyes formed at the ends for attachment to the wall by means of screws. A number of pieces of $\frac{1}{8}$ -in. sheet iron, with one edge rolled over the rod so that they pivot and slide on it, are provided, a slot being filed or cut in the other end to accommodate the shanks of the tools. When a tool is suspended in the slot, its lower end will rest against the wall.



Rack Attached to Wall Holds Tools of Various Shapes and Sizes



Simple Outdoor Stove, Which Burns Large Logs, Has Stovepipe to Carry Off the Smoke

An Outdoor Stove

Campers will find this fireplace to be very similar to a stove, as it has both an intake and an outlet for the draft. It works best in clay soil, because the heat of the fire will not cause this soil to crumble and cave into the fire pit as is the case with sandy soil. Merely dig a hole in the ground, as shown in the detail, lay a piece of heavy sheet metal over the center and arrange a stovepipe at one end. The opposite end is left open as a draft entrance.

The latter should be sloping so that the fire can be fed with fair-sized logs, which can be shoved in as the end burns off. The stovepipe should project at least 1 ft. above the ground so that smoke will not annoy the person doing the cooking, and a 4-ft. pipe is still better if the wind is from such a direction that it tends to drive the smoke on the fireplace.—Robert Rollins, Berkeley, Calif.



Oarlock Attached to Stern of Boat Permits the Use of an Oar for Rudder

Oar Used as Rudder for Rowboat

I have found that by fastening an oarlock to the center of the transom of a rowboat, and putting an oar in it, a good rudder is provided. Besides the advantage of the simplicity of attachment, this rudder can be used in very shallow water.—Roger Altpeter, Baraboo, Wis.

Drilling Glass

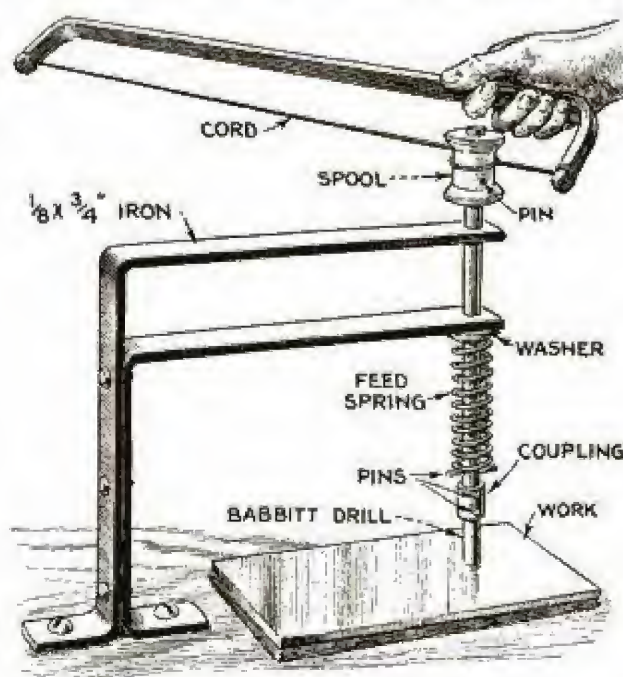
While making a frictional electricity machine, I had occasion to drill several holes in glass. An ordinary hand drill was found useless for the purpose, so I devised the drill shown in the drawing. It consists of a flat-iron frame having two arms that extend horizontally, one over the other. Holes were drilled through the ends to receive a metal rod in a vertical position, the holes serving as bearings. The rod is turned by means of a bow, the cord of which is wrapped once or twice around a wooden spool driven on the end of the rod. A coupling at the

lower end of the rod serves for the attachment of a drill. I used a copper drill at first, but found babbitt worked much better. The drill was fed with fine emery. A coil spring provides downward pressure. A mixture of camphor and turpentine was used as a drilling compound.—M. Andrews, Chicago, Ill.

Play Safe While Working on Your Car

The first thing to do when adjusting one of the bearings of an auto is to disconnect one battery lead, so that you will be in no danger if a child or some careless person inadvertently steps on the starter while you have your hands inside of the crankcase. When working under the car, many people make the mistake of placing themselves in such a position that their hands are right over their face. If you do that, do not blame the car or anyone else if you get some dirt or oil in your eyes, or worse still, drop a pair of pliers, wrench or other part on your nose. When installing new pistons or piston rings, it is advisable to wear a pair of canvas gloves while handling the rings, as the edges are very sharp and may cause deep cuts. If any oil or gasoline gets on the floor, be careful not to throw a lighted match or cigaret on the spot. A warning against such an obviously foolish act may seem unnecessary, but these things hap-

pen so often that it may well bear repetition. Also take care that live electrical wire cannot make contacts that may cause a short circuit and result in a fire. Always lock a car when jacked up so that it will be supported without any danger of slipping off. Remember that a rope hoist and even a chain hoist is not always safe; keep yourself out of positions where you will be injured in case it falls.



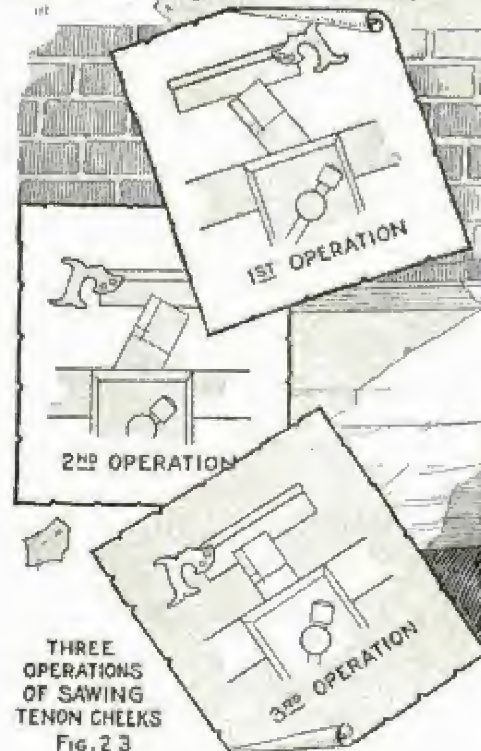
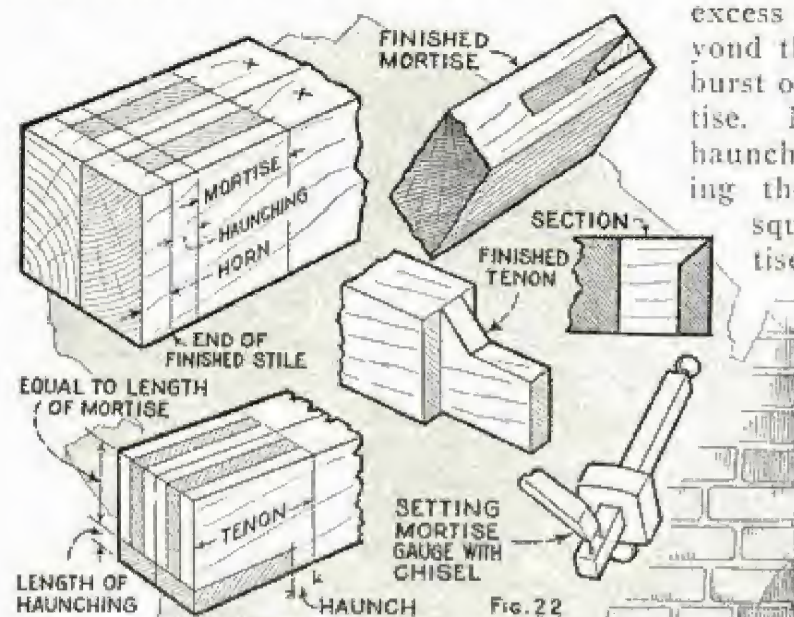
This Outfit, Actuated by Means of a Bow, Facilitates Drilling of Glass

Wood Joints for the Amateur

PART V

NO MATTER what the type of framing in which the mortise-and-tenon joint is to be used, the first thing necessary to do with the stock is to plane the face side and edges of the wood true and out of wind. Plane the face side first, and mark it, then plane the best edge and place the edge mark (X) on it. If the wood is

Now set the two stiles with their face sides together, as shown in the upper detail, Fig. 22, and mark the length of the individual mortises with square and marking knife, carrying the marks across both pieces, so that they will be marked exactly alike. The horn, or extra length at the end of the stiles, is important, because the excess wood here prevents the wood beyond the end of the mortise from being burst out when cutting or fitting the mortise. Note that provision is made for haunching the tenon, and that lines denoting the length of the haunching are squared across the work. Set a mortise gauge to the width of the chisel



too thick or wide, set a marking gauge to the desired width and thickness, mark the wood, gauging always from the face side and edge, and plane down to size.



to be used for cutting the mortise, and gauge the width of the mortises on the work, gauging from the face sides. Mortises are usually cut one-third the thickness of the stock, so, when setting the gauge, the inner marking point is first set to one-third the thickness, then the outer point is set to the chisel. An ordinary marking gauge, of course, may be used, but it necessitates two settings and markings. If a number of frames are to be made up at the same time, all similar parts of the work should be done at once. That is, the stock should all be planed at once, cut to length at the same time, the stiles paired, marked and laid out at the same time, and so on; thus one setting of the gauge will serve for all the pieces, and much time and confusion is saved.

Then set the two rails together as shown in the lower detail, Fig. 22, and lay out the length and width of the tenons, the length and depth of the haunches, and lastly the thickness of the tenons, gauging marks for the latter down the ends of the rails as well as on the edges, and taking care always to use the gauge from the face side. Next, take a rail, grip it in the vise as shown in the upper sketch, Fig. 23, and saw the cheeks of the tenon down to the line marking its length, keeping the saw kerf in the waste. Turn the rail around and saw down the opposite edge, as shown in the center sketch, and finally set the rail upright in the vise and saw down straight. The saw kerfs first made will guide the saw, and the amateur will find this method of sawing much easier than that of trying to saw straight down at once. Cut along the line for the haunch in the same fashion. Lay the rail down on a bench hook, as shown in Fig. 24, and cut the shoulders, making a starting groove for the saw as described in Fig. 1, Part II. Finally, cut the shoulder on the haunch.

There are several methods of cutting mortises by hand, a popular one being shown in Fig. 25. Select a drill bit, about $\frac{1}{16}$ in. less in diameter than the width of the mortise, and drill out the waste as shown, taking care that the drill is kept square in both directions. After most of the waste has been removed in this manner, the sides of the mortise are pared with a keen chisel and lastly the ends.

The other two methods shown are similar in that the chisel alone is used to cut the mortise, but the method of using the chisel in each is different. Some workers swear by one method, and some by the other; the amateur is advised to try both, and to stick to the one he finds the easier.

In either case, the work is gripped solidly in the vise, or clamped firmly to the bench. Now take a chisel of the same width as the finished mortise is to be, and drive it in slantingly, as shown at A, Fig. 26. Pull the chisel out and drive it in as shown at B, thus releasing a chip. Drive in again as at C, remove, and release another chip, as at D. Use a mallet, or the side of the hammer, for driving in the chisel. Take chip after chip in this manner until the cut has reached about the center of the mortise. The section to the right shows how these slanting cuts are made at A, B, C, D, E and F. Now, holding the chisel vertically, drive it down along the line of the cut numbered 1 in the sectional sketch, pry out the chip and take cut No. 2, then 3, and so on, until the end of the mortise is reached. Make similar cuts (7, 8, 9, etc.) toward the other end of the mortise, then turn the work over and proceed in the same way to cut out the other half. The whole thing takes less time to do than to describe, and is not nearly so difficult as it looks. It is advisable, however, to practise a little on scrap wood before using either method on a member intended for a fine piece of furniture.

In the second method, Fig. 27, the chopping out of the mortise is started at the end instead of at the center. Stand at one end of the work, and drive the chisel down into the wood, bevel away from you, about $\frac{3}{16}$ in. from the farther end of the mortise. The reason for keeping the bevel toward the end of the mortise (see A, Fig. 27) and away from the worker is that, when the chisel is driven into the wood, the bevel forces it to move forward a little, and if the bevel were turned toward you, the chisel would move toward the end of the mortise, and might damage what will later be the edge of the latter. Now, still keeping the bevel toward the end, take a cut as shown at B, and pry out the chip. Take another cut as at C, then a vertical cut along the line of the first one, and continue, prying out the chips and cutting, as

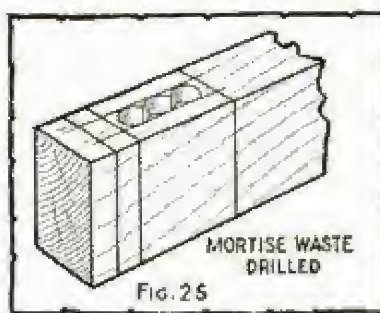
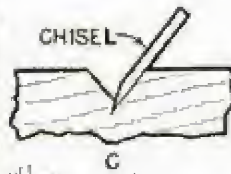


Fig. 25



C



D

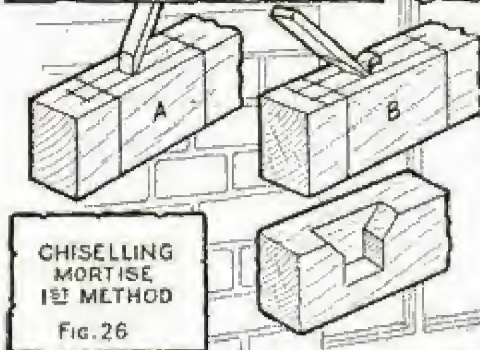


Fig. 26

CHISELLING MORTISE, 2ND METHOD
Fig. 27

indicated by the dotted lines in D and E. When halfway through the work, take vertical cuts, as at F, to square up the ends of the mortise, then turn the work over and complete the mortise from the other side.

There are several variations of both the above methods, but the principle is the same in all. Be sure to keep the final cuts square with the edges, so that the ends of the mortises will neither have humps nor hollows in the center of the work. The fitting of the haunch on the tenon to the haunching in the mortise, and the cutting of the latter, is a simple job for the paring chisel.

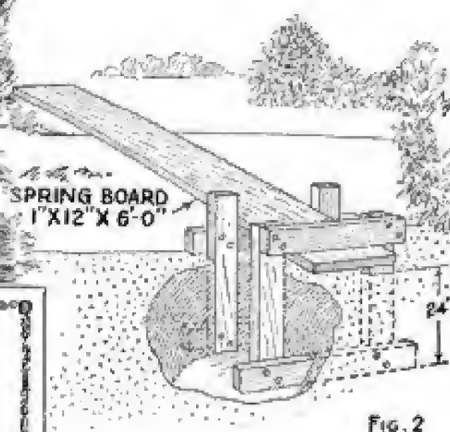
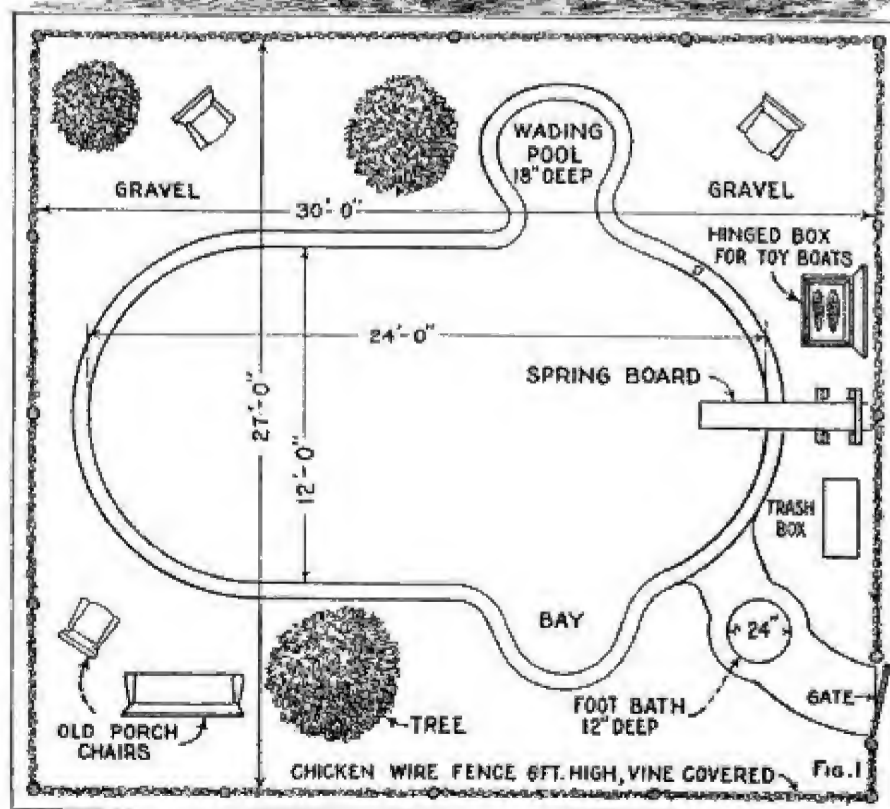
Fig. 28 shows a variation of the tenon, which is useful for framing work that must be knocked down occasionally, and yet be firm and solid when assembled. Its

construction is obvious, but the wedge should not have too much taper, neither should the amount of bevel on the dovetail be too great; 10° from the hori-

DOVETAILED AND WEDGED TENON
Fig. 28

zontal is sufficient. The tenon is laid out and sawed as for an ordinary joint, then the dovetail may be laid out on the cheeks with a bevel gauge, and sawed or pared to shape. The mortise should be cut to the smaller size of the opening, then pared to fit the bevel gauge.

Waterproof cement can be made from bichromate of potash, 8 oz. by weight, gelatine size, 11 oz., and alum, 1 oz.; dissolve the gelatine in a little water, then add the bichromate and alum.



necessary, since so many capable boys in the neighborhood clamored to have a hand in it. They proved good workers.

Incidentally, the pool has made a very attractive corner out of what seemed destined to become a rubbish heap.

Any location, within reach of a water supply, is satisfactory, though if you have any choice, always select the highest ground. This facilitates draining. Our

SWIMMING pools are generally assumed to be luxuries reserved for those of ample means. Here is one the rest of us can afford. The materials for the original illustrated cost only \$17.20, which covered eight bags of cement and four yards of sand and gravel. The price of cement at 65 cents per bag and sand and gravel at \$3 per yard was secured through a friendly contractor building a house next door, but even purchased direct, they cannot be much higher elsewhere in the country.

No outside labor was hired. It wasn't

pool has no drain at the bottom, and the water is dipped out by means of a well-sweep, a process which may seem slow at first glance, but which proved by far the best method. Besides, it eliminates the costly complication of a sewer connection. Located high enough, the water can be siphoned out, but if on low ground, it cannot be distributed to garden and lawn. The efficiency and convenience of the well-sweep will be explained later.

Having selected the location, mark out your desired outlines. The irregular shape of the writer's pool—the neighborhood

1954 Brugada Ave
Paradise
Calif

Swimming Pool

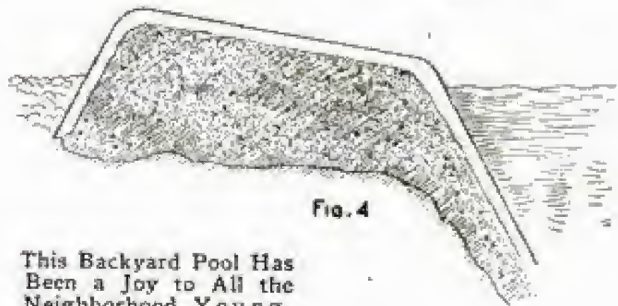
Hi Sibley

pool, that is, for they all use it—was designed thus to get around trees on the plot. (See Fig. 1.) Any shape may be chosen, though irregular lines are more pleasing than the conventional rectangle.

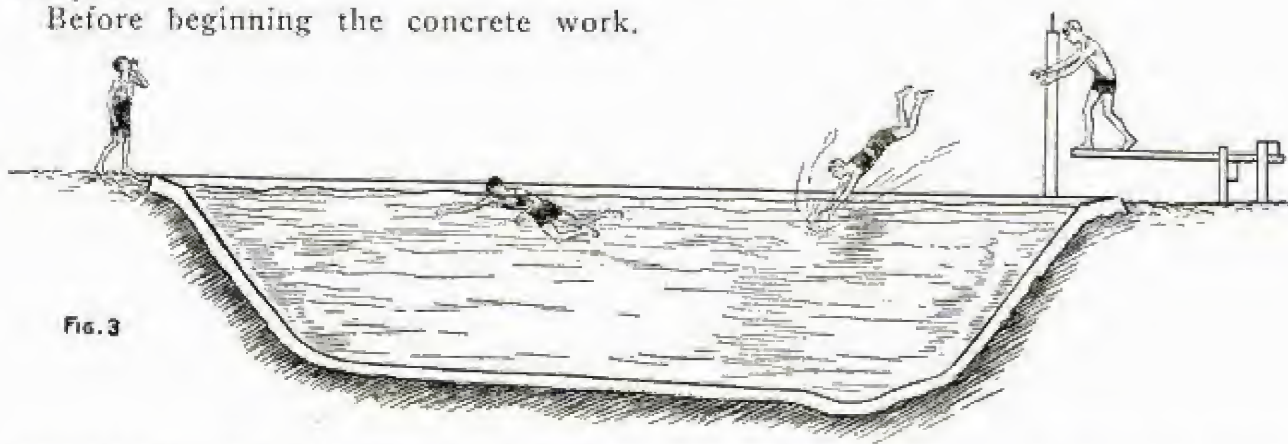
In case the soil is dry and hard, scoop out enough to hold a puddle of water. Let this soak in two or three days, and then dig, distributing the dirt removed around the edges of the hole. Thus you will be obliged to dig only 3 or 4 ft. for a 5-ft. depth. Grade off this loose soil around the edges so that it slopes away from the pool. This will carry the water off to the vines which are to be planted around the borders of the plot. A 45° slope is not too steep for a child to climb out, and will hold the fresh concrete nicely. However, you can work at even a 60° angle. At the deep end, make a slight depression so that, in cleaning, sediment can be washed into this pocket and bailed out easily.

When excavating is completed, sprinkle the sides with a fine spray but take care not to wash it down. See that the edges are also packed down well by tramping on them. Otherwise your parapet will crack when the soil beneath begins to settle from the moisture splashed out of the pool.

Before beginning the concrete work,



This Backyard Pool Has Been a Joy to All the Neighborhood Youngsters; the Gang Shown in the Head Have All Learned to Swim in It



make a small mixing boat as shown in Fig. 6. You will find it handy for many other jobs thereafter. One with a galvanized

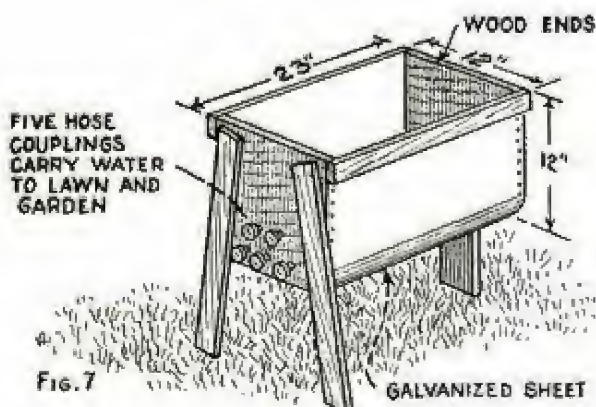
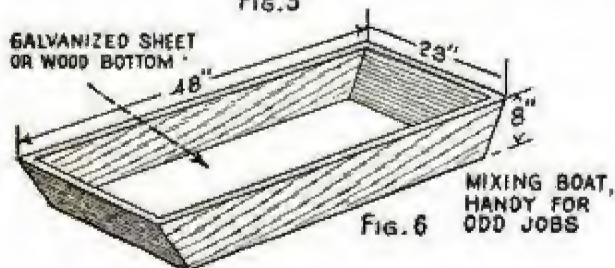
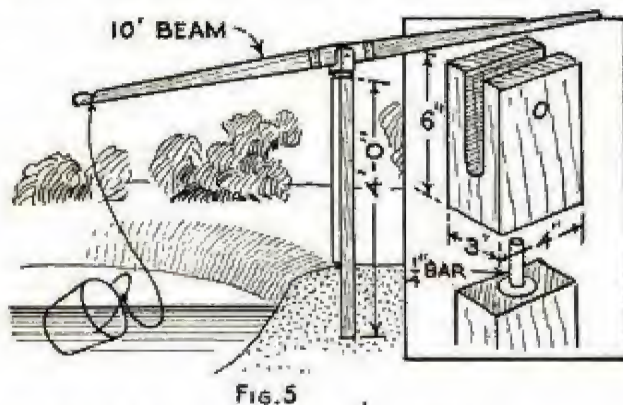
sheet-iron bottom is preferable to wood.

It may interest and encourage the beginner to know that the writer never



mixed a trowelful of concrete before beginning on this job. The result, however, has proved satisfactory after a summer of daily use. In fact, the legion of young water dogs that have sprung up in this vicinity indulged in a daily plunge all through last October.

Mix Portland cement in the proportion of one shovelful to seven of coarse sand and gravel, with enough water to make it of a mushy consistency. Lay it about 2 in. thick, as indicated in the sections, Figs. 3 and



The Wellsweep and Distributing Tank Shown in the Photo Serve the Double Purpose of Bailing Out the Pool and Watering the Lawn and Garden

4. Experienced concrete workers predicted this would not be thick enough, but in practice it has withstood a long, hard season, and there are no signs of cracking. On this job, we began at the top and worked toward the bottom; you may find it more convenient the other way around. The parapet should be 5 or 6 in. thick. A mason's straightedge with level is the proper instrument for getting the parapet level, but not having this equipment, we constructed a makeshift device, as shown in the sketch, Fig. 8. By means of this we were able to stake out strings, criss-cross and along the parapet, which were fairly level.

The first rough course was allowed to set for two days, being frequently sprinkled on the second day. On the third day, work commenced with the second course, consisting of one part cement to five of fine sand, and water. This was laid about $\frac{1}{2}$ in. thick, allowed to set two days and kept moist in the meantime. While this is green, make it as smooth as possible with the trowel, as ridges and humps are uncomfortable to the feet. For the final coat, mix waterproof cement and water to a soupy consistency, and paint the entire surface, using a long-handled calcimine brush. This, too, should be sprinkled on the second or third day, or as soon as it will take water without running.

Spread loose gravel around the pool to a depth of 2 or 3 in. This is to prevent dirt being tracked into the pool. Don't

make the mistake the writer did at first, of putting sod around the parapet. It looked well, but soon after bathers began running around and splashed water over it, it became a morass. All of it had to be taken up and replaced with gravel. The latter allows the water to drain off to the edges without any mud.

The foot bath, a small pool built 3 or 4 in. lower than the parapet, is a great help in keeping the water clean. It is located between the entrance and pool, so that all bathers must step in it first. Around the plot a 6-ft. chicken-wire fence was erected, and fast-growing vines, such as morning glory and Japanese hop, were planted. The fence is almost a necessity, as the pool is such an attraction that uninvited guests will make use of it at all times if it is accessible. Water splashed from the pool assures a most luxuriant growth of

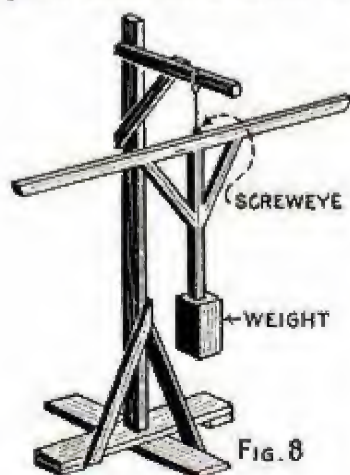


FIG. 8

vines. A neat packing box, with a hinged lid and perforated in the bottom to drain, is a great convenience for storing toy boats and water toys, and a trash box will take care of the leaves, sticks and general rubbish that are

bound to accumulate. These, as well as the fence, were painted moss-green. Discarded wicker porch chairs provide comfort for spectators and bathers. A short springboard (Fig. 2) at the deeper end will help the beginner in diving. This can be firmly anchored by pieces of two-by-fours, arranged as in the diagram and buried about 2 ft. deep. If you have plenty of material left over from the pool, set the two-by-fours in concrete and they are there to stay. A piece of al-



Bird's-Eye View of the Completed Pool, Which Is Never Without Its Quota of Enthusiastic "Water Babies"

most any available lumber, 1 by 12 in. by about 6 ft. long, makes a good springboard. Don't locate this too high above the surface of the pool, unless all your swimmers are practiced shallow divers.

Under normal conditions the water in the pool will keep fairly clear for about two weeks. Copper-sulphate crystals in a cloth bag should be swished through the water every morning—just enough to give a faint blue tint. This is done to prevent the growth of algæ, the greenish plant present in all stagnant water.

About 24 hours were required for siphoning with a 1-in. hose. This, of course,



Close-Up of the Distributing Tank, with One Hose in Place; the Sweep Is Removed from Post in This View

involved no labor, but all the water was lost because the only place low enough was some distance from the pool. In order to apply this useful water to our own plants, a wellsweep and distributing tank, Figs. 5 and 7, were made.

This might seem a laborious process, but it is not. We have unlimited man power. By working the sweep, the boys earn their right to use the pool, and take turns at beam or bucket. We always have more help than can be used on the bi-monthly bailing.

When making the pool, set a post, about 3 by 4 in., in the concrete parapet at the deep end, so that about 4 ft. is above the surface. Bore a hole in the top to receive a piece of $\frac{5}{8}$ -in. bar iron. A bolt, with head cut off, or section of cold-rolled steel, will do. The swivel or beam fork is sawed out from a wood block, as shown.

The distributing tank consists of two wooden ends, 12 by 12 in. by about 1 in. thick, to which is nailed a single sheet of galvanized iron, forming sides and bottom. The lower corners of the ends are rounded in order to fit the sheet iron snugly at these points. Only three legs are used so that the tank will stand level wherever placed. In one end, install five hose couplings, which number will drain the water as fast as the tank can be filled with wellsweep and bucket. Hot tar is poured into corners where galvanized iron joins the wood ends, and a piece of wire screen is tacked in the draining end. Do not place the screen flat against openings, as it will soon clog with leaves and debris. Bend the screen out so that it bulges 2 or 3 in.

The object of the raised distributing tank is to give gravity to carry water through the five lengths of hose to various parts of lawn and garden. Three days before

draining, discontinue the copper-sulphate treatment, as it is well not to run off too strong a solution on delicate plants. However, although we have been careless on this point, we have not yet detected the slightest damage to any of our plants or grass.

Maintenance, as well as construction, has been very inexpensive. With two fillings per month, our water bill has averaged only \$5.50, which included a liberal use in the house and on the front lawn, during our five months of dry weather.

In many ways this pool has been a great success. Six young boys of the neighborhood learned to swim here the first week, a feat none of them had been able to achieve at the various sea beaches, on account of the surf. It is a certain means of keeping adventurous children at home, and even in colder weather is a popular "proving ground" for toy craft of all types. Shipbuilding has developed amazingly in our workshop, and no investment we ever made returned such dividends in wholesome recreation.

Iceless Refrigerator for Campers

An iceless refrigerator can be made easily and cheaply by any camper. It consists of a cylinder, about 12 in. in diameter and 24 in. long, made of reasonably heavy canvas. Two wooden disks, 12 in. in diameter, are placed in the cylinder as shown in the sketch. The bottom disk is provided with ventilation holes covered with fly screen, and the canvas is attached to it, preferably with copper tacks. The middle disk, located 15 in. from the bottom, has a deep groove in its circumference, and is held in place by binding the canvas tightly to it with several turns of soft cotton cord, such as



Collapsible, Iceless Refrigerator, Made of Canvas, Keeps Food Cool in Camp

chalk line. The canvas wall of the lower compartment is cut to provide an opening, about 6 by 10 in. in dimensions. Hems are stitched in the top and bottom of the door and a removable wire frame is inserted to hold the door in shape. When the door is closed, an overlapping flap of rubber, cut from an old inner tube, effectively seals all openings against flies. The upper compartment, which is also fitted with a wire ring and a bail at the top, is filled with water. The capillary action of the water keeps the entire canvas moistened, and the resulting evaporation keeps the contents of the lower compartment cool. If the cooler is suspended by two strands of reasonably long rope which are twisted a number of turns, it will revolve back and forth for quite a while by the untwisting and retwisting of the strands, which action will increase the cooling effect considerably. When the wire frame is removed from the door, the cooler collapses into a compact bundle.

Light to Illuminate Motometer

At night, a motometer cannot be seen by the driver unless the car is fitted with cowl lights. It is highly important, however, that the engine temperature should be known at all times, especially during winter driving when a hand-operated shutter is used to regulate the cooling of the motor. It is a simple matter to provide a lamp behind the motometer to enable the driver

to see it. Mount an ordinary dash lamp on a bracket extended from the radiator cap or motometer, and run a length of insulated wire underneath the hood from the lamp to a switch on the



instrument board, then connect the other side of the switch to the live terminal of the ammeter.—Irving C. Valentine, Winsted, Conn.

Manipulating Lawn Mower on Terraces



Driving Reins Provided on Lawn Mower Help Manipulate It on Steep Terraces

A simple hitch for your lawn mower that will help cut the grass on terraces, consists of a length of clothesline to guide the mower. The ends of the rope are tied to the fork of the mower, and the rope is then looped around the handholds, as shown. The user stands on the crest of the terrace and can direct the mower up and down, no matter how steep the terrace may be.—G. H. Dacy, Bethesda, Md.

Easy Method of Replacing Auto Rear End

When replacing a rear end under a car, it is usually quite difficult to lift the driveshaft tube and guide the end of the shaft into the universal joint. If a long plank or piece of timber is put over the rear axle and under the driveshaft tube, the end that hangs over at the back will balance the rear end, so that all you have to do is to guide the end of the shaft into place.

□ A label paste for bottles can be made by soaking strong glue in strong vinegar, boiling and then adding flour; this adhesive will not decompose.

Homemade Slide for the Children

A slide, practically as good as the coveted one on the school ground, can be made



Simple Wooden Slide, Costing Less Than Two Dollars. Provides Amusement for the Young Children

at home at low cost. Get a board, 1 ft. wide and 10 ft. long, and nail 5-in. strips on both sides. Spruce is the best wood to use for this purpose, but pine also will do. Of course, it is absolutely necessary that the wood is very smooth, to avoid the danger of splinters. After sanding it and removing all the rough edges, apply floor wax. The top part of the side rails should be rounded with a plane. This slide can be adjusted for safety for children of various ages, one end being elevated to the desired height. When not in use, place the slide on the porch or in the garage to keep it out of the sun and rain.—Emma K. Hulburt, Kirksville, Mo.

Safety Cistern Cover

The drawing shows a safety cistern cover which was made by the father to prevent his three-year-old boy, who was more than ordinarily inquisitive, from falling into it. As the cistern wall neared the top of the ground and converged to form the neck, a cylinder of galvanized iron was shaped and put in place for the inner form of the

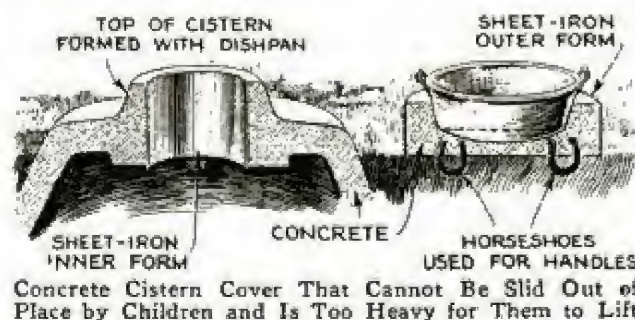
neck. The soft concrete was brought up to a level all the way around the cylinder, which was left to project above the surface of the concrete as much as the depth of a large dishpan. Additional concrete, mixed quite soft, was then shaped about the top of the neck and the dishpan was turned over it, upside down, and rotated to smooth the concrete. After thirty minutes, it was slowly turned and lifted off. The dishpan was then used for the inside form for the top, which was cast in another short cylinder of galvanized iron, having a diameter 8 in. larger than that of the dishpan.

A plot of ground was leveled off and two horseshoes set in it with the ends projecting about 3 in. The outer form was set directly over them and the concrete was shaped about the pan, which was placed right side up. When cured, the cover fitted snugly over the neck of the cistern. The horseshoes are used to lift the cover off.—Dale R. Van Horn, Lincoln, Nebr.

How to Handle Hot Outboard Motor

It is often necessary to remove an outboard motor from a boat while the motor is still hot. A strap, or rope, looped around the cylinders will facilitate the handling, but as this may burn or scorch if it comes in contact with the hot exhaust pipe, a better method is to obtain a 5-ft. length of motorcycle brake lining and rivet the ends together to form an endless loop. This loop can be shaped to form an "S" under and around the pair

of cylinders, and the motor can easily be lifted and carried. Brake lining, besides being exceptionally strong, is composed of an asbestos base and is not easily damaged by heat.



SHOP NOTES



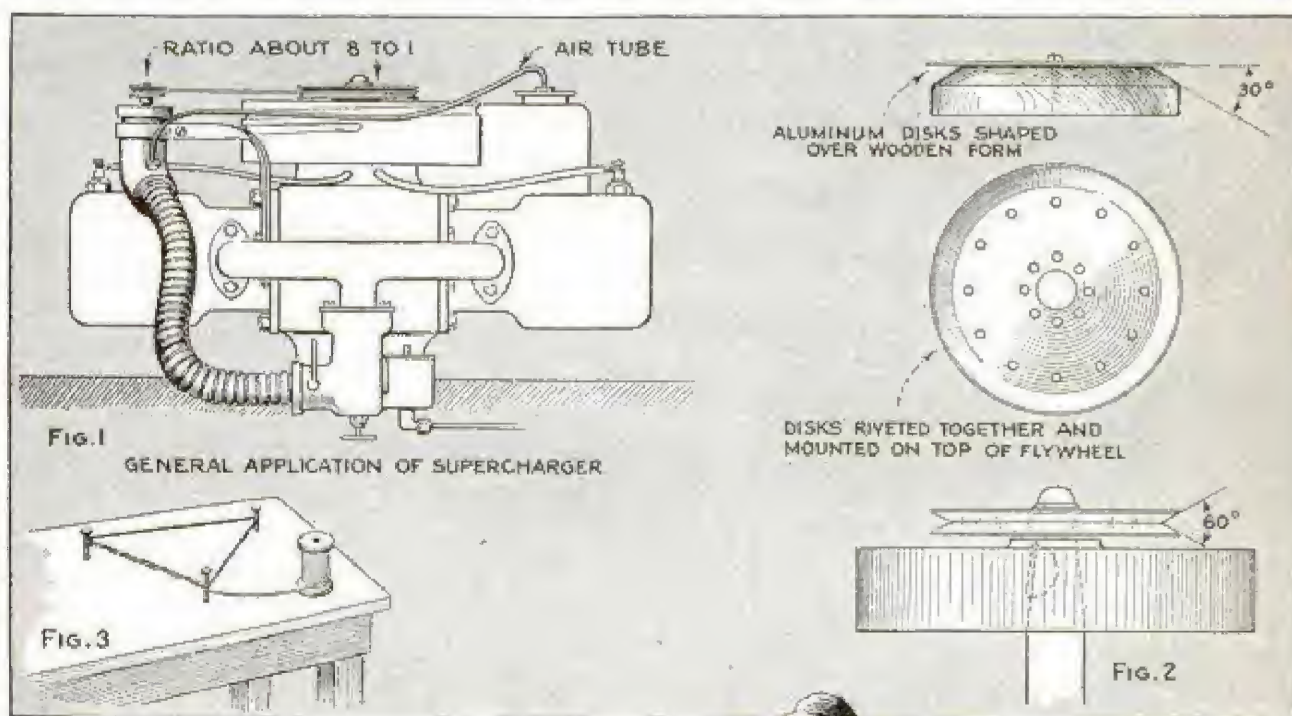
Supercharger for Outboard Motor

By DICK COLE

THE APPLICATION of a supercharger tends to remedy an inherent fault of the two-cycle motor. While it does not give added compression, as in the four-cycle motor, it does provide a cleaner, less diluted charge in the cylinder, which results in a marked increase in power.

This will be of particular interest to outboard-motor fans, for it is in that field that the two-cycle motor is used extensively—almost exclusively.

This article describes a simple supercharger which can be made by the amateur mechanic. It is not an engineering



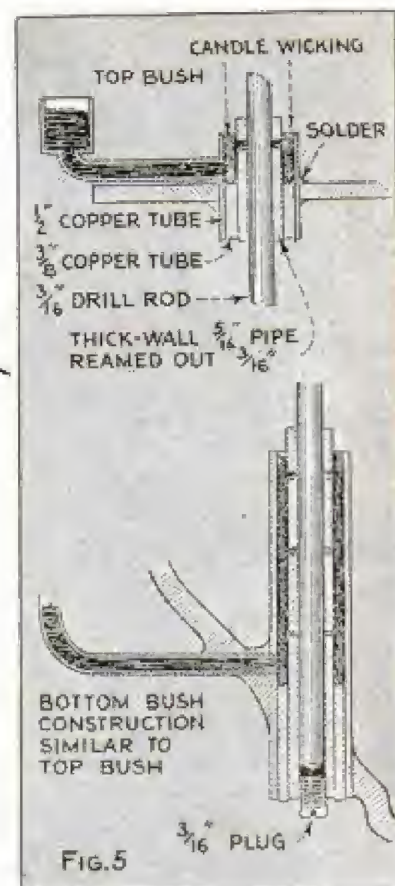
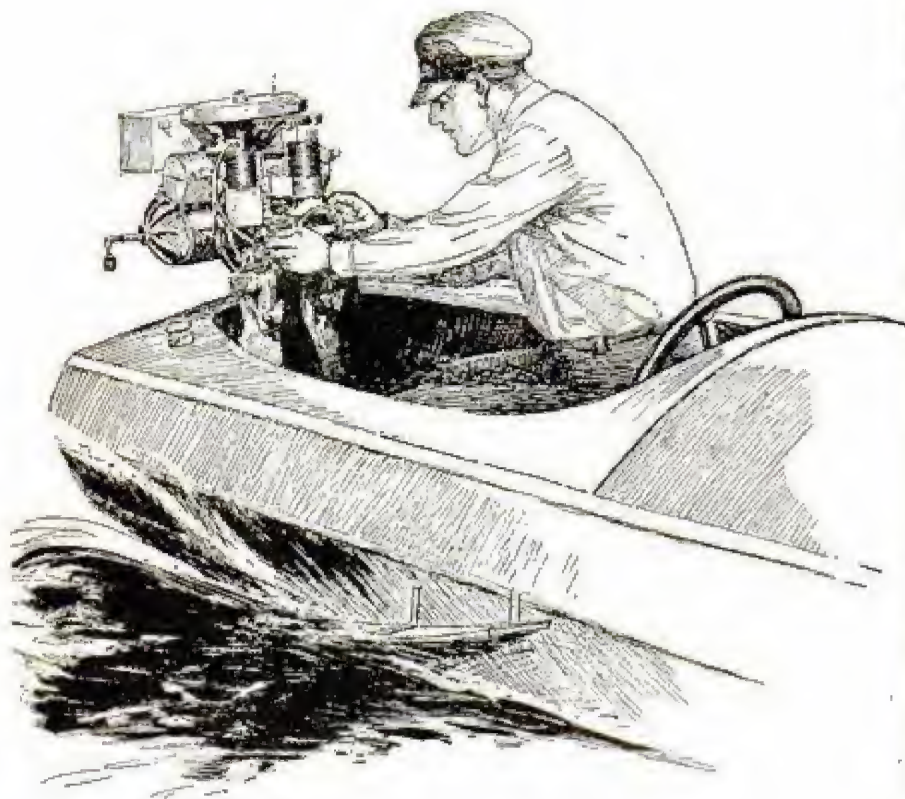


FIG. 5

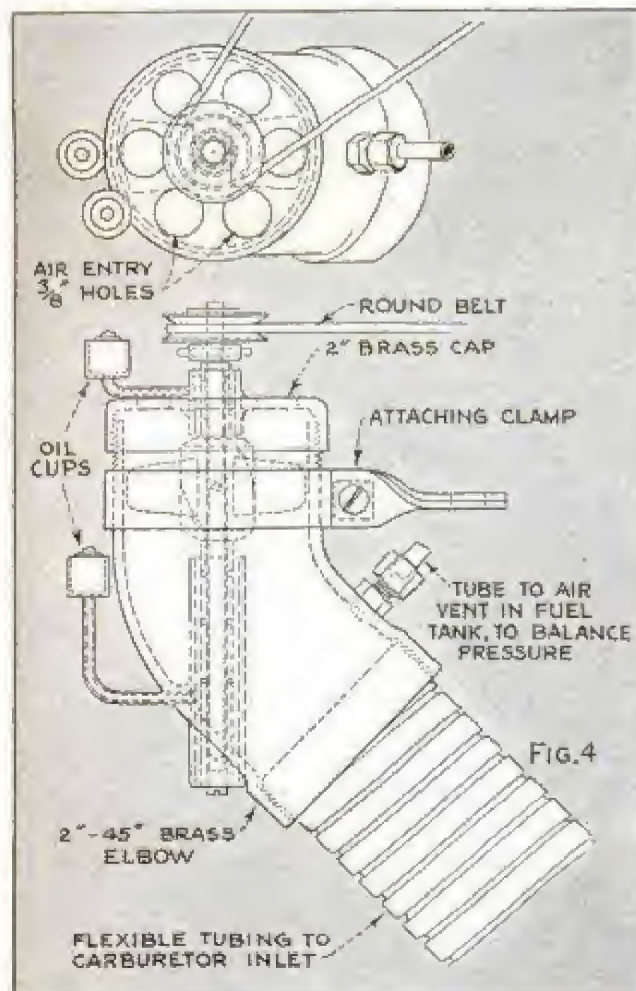


FIG. 4

masterpiece, but it fulfills its purpose very well. Its application to an outboard mo-

tor will show, not only more actual piston power, but also a much greater range of engine speed. This will permit the fitting of a higher-speed propeller, and more miles per hour can be attained.

Fig. 1 shows the application of the supercharger. Its construction is self-apparent. No fixed dimensions for the whole assembly can be given, because the 2-in. brass elbow used for the main body of the supercharger varies with different manufacturers. Fig. 4 shows a 45° elbow used, but a 90° elbow may be more adaptable to some outboard motors. A male and female elbow (street elbow) is most suitable. A cap, drilled for bushing and for air vents, is fitted to the male end. The threads in the female end can be scraped down so as to receive the end of the flexible metal tubing leading to the carburetor inlet. To drill accurately the lower bushing hole, it is suggested that a hardwood plug with a pilot center hole be placed in the elbow to guide the drill. The rotor shaft is of 3/16-in. drill rod. The rotor hub is of 3/4-in. brass. With a hacksaw, this is slotted deeply at an angle of 45° to center line. Brass or copper blades are then soldered into the slots. Owing to the speed at which the shaft turns, the

rotor must be accurately balanced. This can be determined by rolling the rotor-shaft on two knife-edges.

Positive lubrication of the rotor-shaft bearings is absolutely essential. A very satisfactory way to achieve this is illustrated in Fig. 5. Note how lengths of copper tubing of different diameters are sweated together to form an oil well around each bush. Small holes in the bushes lead the oil to the shaft. Oil cups keep the wells replenished.

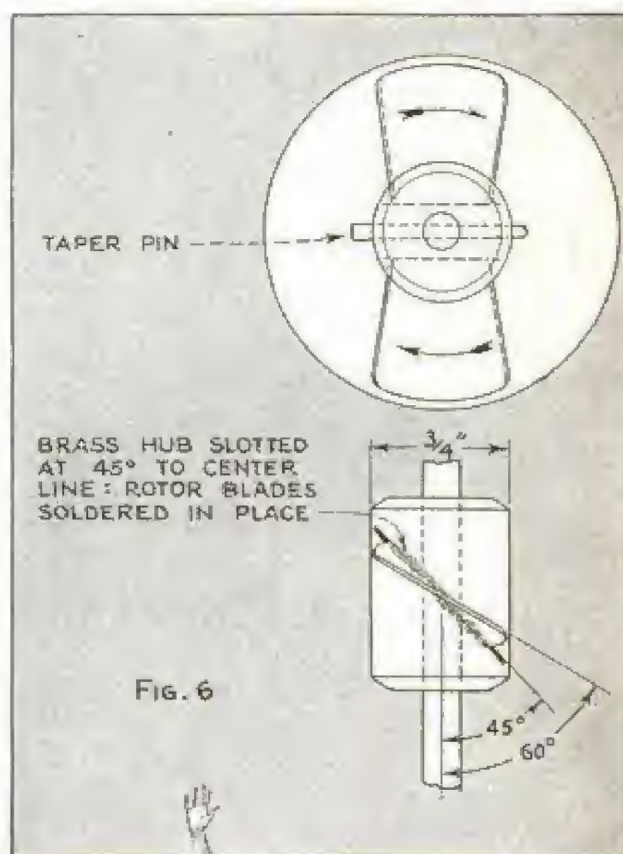
The size of the pulley on the rotor shaft depends upon the driving pulley. This, in turn, depends upon the design of the outboard motor to which the supercharger is to be attached. An 8-to-1 ratio will provide ample speed. At 2,500-revolution motor speed, the supercharger will rotate 20,000 r.p.m.

It is well, when using a supercharger, to balance the pressure of the air in the fuel tank with the pressure against the jet in the carburetor. So, a small rubber tube is led from a nipple in the supercharger body to the fuel tank. A short piece of copper tubing, soldered to the filler cap, will receive the rubber tubing.

The manner of attaching the supercharger is suggested in Fig. 1. First, a pulley must be made to fit under the fly-wheel nut. Two disks of fairly heavy sheet aluminum can be shaped over a wooden form, and then be riveted together, forming a 60° V-pulley, as shown in Fig. 2. The size of the pulley depends upon the make of the outboard motor. On some motors using a rope starter, the pulley, of necessity, must be small. However, a correspondingly small pulley on the supercharger shaft will establish an 8-to-1 ratio.

A bracket must be constructed to support the supercharger with the two pulleys in line. There always are bolts on a motor which can be utilized for this.

The best high-speed belt the writer has been able to evolve is made of shoemakers' twine. The length of the belt required is determined with a piece of string. Then three nails are driven, with a triangular boundary equal to the length of the belt, Fig. 3. Six complete turns of the twine are made around the nails, the twine being wrapped around itself at the same time. About three wrappings between the nails



are ample. The ends are tied with a barrel knot, and the endless loop treated with

shoemakers' wax. Such a belt will give much longer service than any leather belt. It is obvious that the belt will interfere with starting the motor. So it is removed and slipped on after the motor is running.

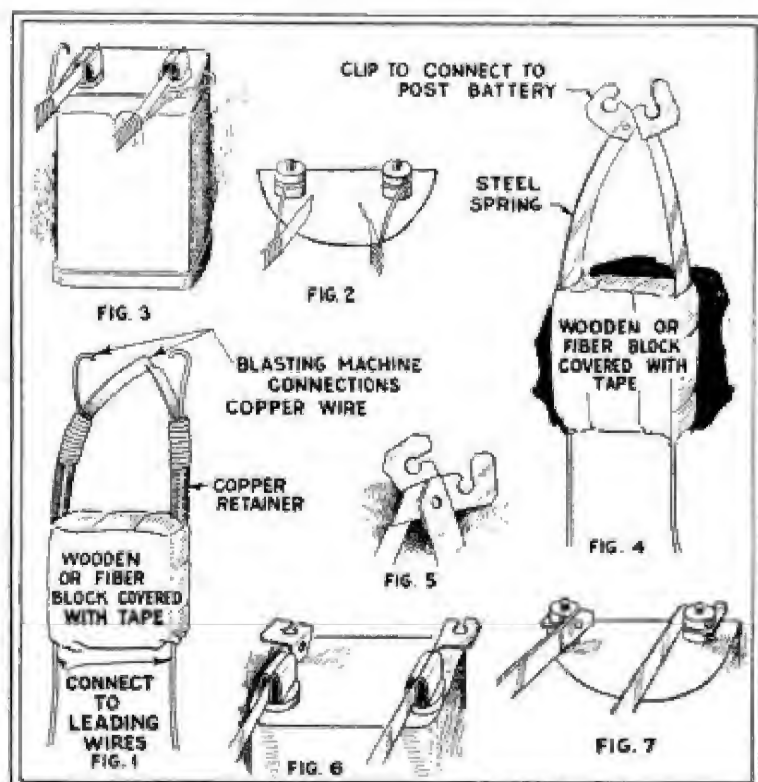
The crude supercharger herewith described will positively give additional power to any outboard motor. Let anyone who doubts it make one with two rotors, one with reversed blades, and try each out. A remarkable difference in power will instantly be noticed. Obviously, one-half of this difference is the additional power above normal provided by the supercharger.

Short-Circuiting Leading Wires of Blasting Apparatus

Electric firing of explosives is undoubtedly the most efficient and the safest method, and it is being widely adopted where well-regulated blasting in coal mining and other industries is done. However, it is not entirely danger-proof. Accidents with electric firing can and do occur if proper precautions are not observed. One of the chief hazards from the outset, and especially after electric cutting and loading machines were introduced in the

mines, is that the wires of an electric detonator or electric blasting circuit accidentally come in contact with some source of electric current or with a stray current, which causes a premature explosion of the detonator alone or of a loaded charge. In one case, a miner who had primed his charge and was taking it into the place where he was to shoot, allowed the wires to dangle. The loose ends came into contact with the mine track, through which a stray current was passing, the charge exploded and the man was killed. Thereafter manufacturers short-circuited the blasting caps by twisting the ends of the wires together. Although this practice greatly reduces the danger, it is not all-sufficient. It does not remove the hazard of stray currents getting into the circuit after the detonator wires have been connected to the leading wires. For years, it has been my instruction to shot-firers, and others who do blasting by the electric method, to twist together the ends of the leading wires that are to be connected to the blasting machine, or other source of current, in order to short-circuit them until the moment comes to make this connection, and as soon as the shot is fired, to disconnect them and twist them together again, thus keeping the

leading wires short-circuited while not in use. Many blasters forget to take this precaution or consider it too troublesome. Consequently two simple devices were introduced. The first, shown in Fig. 1, consists of two pieces of strong steel spring, about $\frac{1}{2}$ in. wide and 4 in. long, with a 6-in. length of copper wire securely fastened against the outer side of each spring by means of a winding of copper wire and a copper sleeve, and with a wooden or fiber block, covered with adhesive tape, placed between the steel springs and bound firmly in place with tape. When the steel springs are fastened in this position, the two ends will automatically come together and remain in contact. The copper wires extending below the wooden block are connected to the leading wires, the latter being then effectively short-cir-

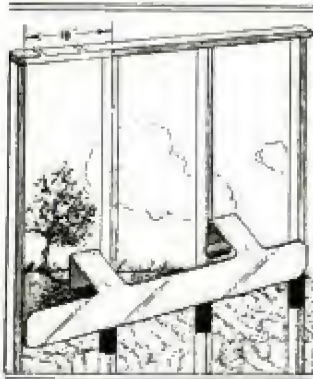


Methods of Short-Circuiting Leading Wires of Blasting Apparatus to Prevent Premature Explosions

cuted. When the time comes to fire the shot, the curved ends of the copper wires are hooked around the binding posts of the blasting machine, as shown in Fig. 2. This separates the springs and breaks the short circuit. When a blasting machine having the spring type of binding post shown in Fig. 3, is in use, the connections are made by slipping the steel springs themselves into the binding posts. This device affords a reliable short circuit for the leading wires and a quick and easy method of connecting them to a blasting machine. It is also cheap and easy to make. The original was made in less than half an hour, and can be duplicated readily by any blaster. Figs. 4 and 5 show another form of the same device, in which the wires end under the taping around the block, and two clips are riveted to the springs for making connections with the blasting-machine posts of the ordinary type. The method of connecting this form of short-circuiting device with the two types of posts used on pocket blasting machines is shown in Figs. 6 and 7.—S. C. Jones, Drexel Hill, Pa.

Spacer for Building Construction

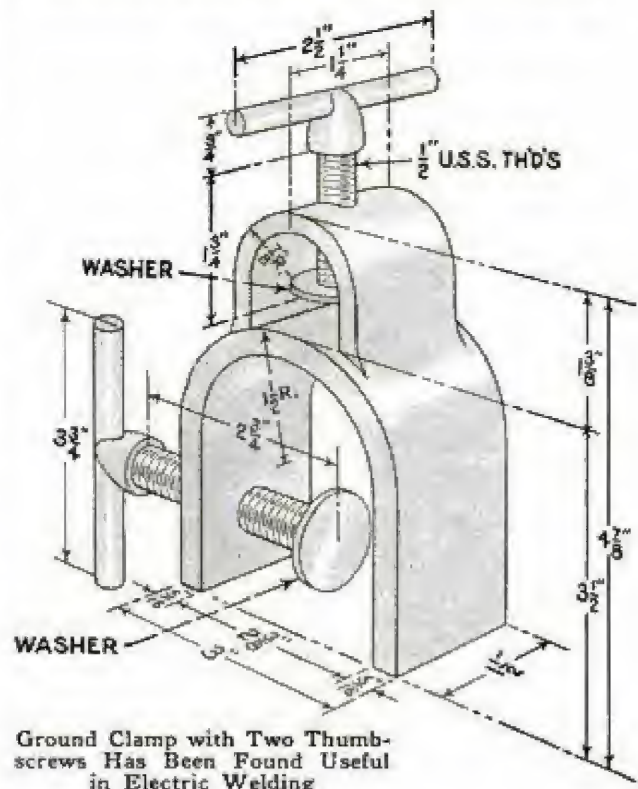
In the construction of any kind of frame building, difficulty is often experienced in nailing up the studs. As a rule, the spacing between them



is not as even as it should be, but the simple spacer shown in the drawing will eliminate this trouble. It consists of a piece of sheet metal, with two arms projecting from one side, the space between their inner edges being equal to the desired space between the studs. The arms are bent to form hooks by which the spacer can be suspended from the top plate. After the first stud is nailed on, the spacer is slid over to find the correct point to nail the second stud, and so on.—John B. Roswick, Sturgis, Mich.

☛ Lima beans can be shelled quickly in a properly adjusted clothes wringer.

Ground Clamp for Electric Welding

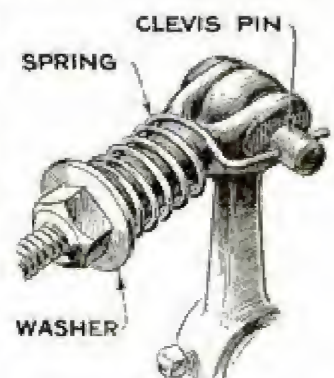


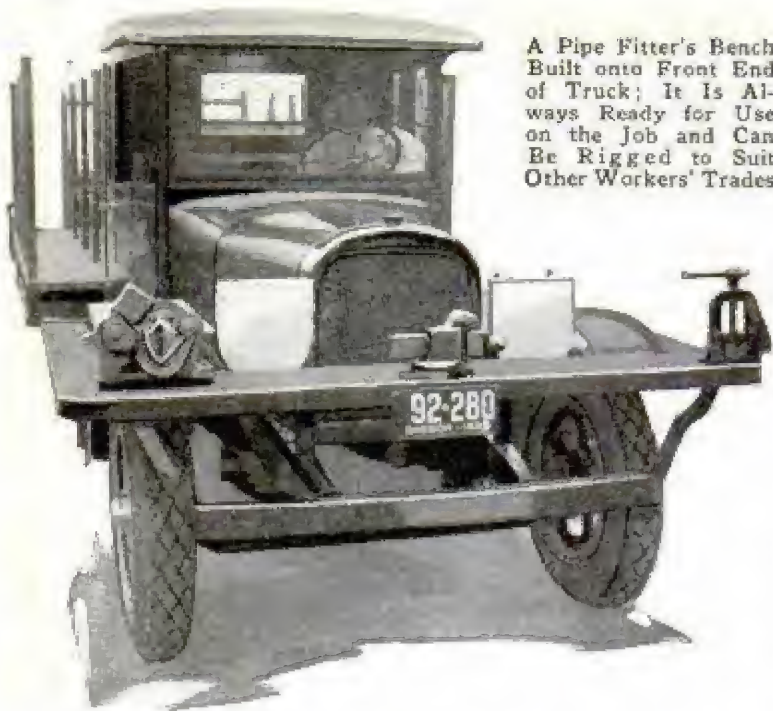
Ground Clamp with Two Thumb-screws Has Been Found Useful in Electric Welding

The illustrated ground clamp can be used with one or more welding machines at the same time. The wires are held in place by the small thumbscrew at the top and cannot get loose or slip out when the screw is securely tightened. The clamp is attached to the work by means of the large thumbscrew, which insures a good electrical contact if the work is clean.—Robert Dinsmore, New York City.

Quickly Removable Cotter Pin

A quickly removable cotter pin, which is useful in places where a pin must frequently be removed from a clevis for adjustment, is shown in the drawing. A coil spring, with one end straightened, is slipped over the clevis, and the far end is rested against a washer placed between the clevis and lock nut. When the pin is removed, the coil spring is pulled back out of the cotter-pin hole.—E. Gunderson, Jr., Humboldt, Iowa.





Workbench on Front of Truck

Here is a handy workbench for the plumber, electrician or other workman who has a truck. It is built right onto the front end, does not hinder loading or unloading and eliminates the need of improvising some sort of bench on the job. The vises for pipe are in line so that they will accommodate pipes or rods drawn lengthwise from the truck.

Making Stereotype Matrices

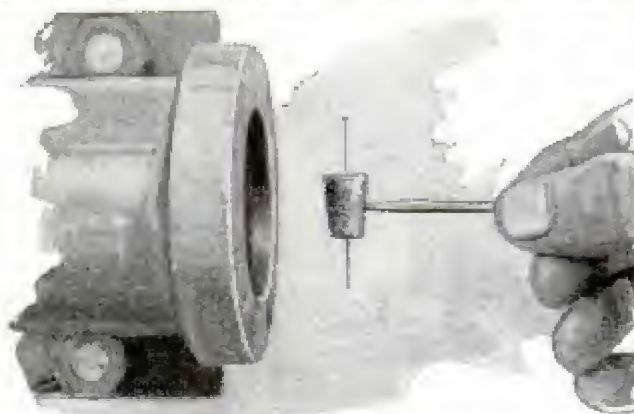
Practically every country newspaper possesses an outfit for casting from paper stereotype matrices, but some of the workmen who do the work have the idea that the operation is a difficult one. As a matter of fact, it is quite easy to make good molds from type or electros provided the formula for compounding the stereo paste is known. Without it, good results are impossible. The paste is compounded from dextrine, 8 parts; gum arabic, 1 part, and water to make a thick mixture, which must be strained through wire gauze to free

it from all lumps. The flongs, or paper molds, are made from three sheets of smooth, tough tissue paper and a backing of thin blotter or porous newsprint, well pasted together and smoothed to an even thickness. These flongs can be dried and preserved for an indefinite period if a few drops of carbolic acid are added to the paste. Previous to use, the flongs are thoroughly dampened until limp and then beaten on the face of the type, which must be well oiled to avoid adherence of the mat. Wood type should be covered with sheets of lead or tin-foil (not aluminum), which will later melt as the cast is poured into the mat. The brush used can be made level-faced by scorch-

ing it on a hot plate and brushing off the burnt tips. After beating in the flong, the hollows should be filled with a mixture of half flour and plaster of paris, the whole topped off with a sheet of soft paper, and then the mat can be dried under a copying press or in the casting box of the stereo outfit. Two or three thicknesses of cotton blanket or heavy cloth must be placed on top of the flong to absorb the moisture, and should remain until the mat is bone-dry. Screw pressure or a heavy weight must be maintained on the mat while it is drying in contact with the type. This mat will often permit casting half a dozen plates before it begins to peel.

Emergency Internal Calipers

In an emergency repair job the writer had to take some internal measurements accurately without the aid of calipers. The illustrated makeshift method was found accurate and satisfactory in every way. Two pins were stuck into opposite ends of a small cork which was forced on a pointed match.—F. W. Bentley, Missouri Valley, Iowa.



Quickly Improvised Internal Caliper Takes Accurate Measurements

Better Wings for Model Planes

By HI SIBLEY

A COMMON defect in practically all model airplanes is the tendency of the wing fabric or paper to sag between the ribs. Besides being detrimental to the appearance of the wing, this loss of smooth contour lessens the lifting power.

By building in a paper honeycomb, as shown in Fig. 1, the difficulty is entirely overcome, and a smooth, tight covering is assured for the life of the plane. Fewer ribs are required—spaced about 8 in. apart—and in patching torn fabric, the honey-

comb permits pressing down on the patch. The care you use in building up the honeycomb will be reflected in the smoothness of the wing. Most any light, thin and stiff paper will do for the cellular core, architects' tracing paper being particularly suitable.

For the purposes of illustration, we will assume that we are making a wing of 6-in. chord by 16 in. long (right wing only), of rectangular design. This will require three ribs, a round-section main spar, a leading spar and a rear spar. White pine is recommended for the ribs, as well as spars, since it is stiffer than balsa wood. Plane the rib pieces down to $\frac{1}{16}$ -in. thickness, cut notches for front and rear spars and very carefully bore hole for the main spar.

Before starting the honeycomb, make a

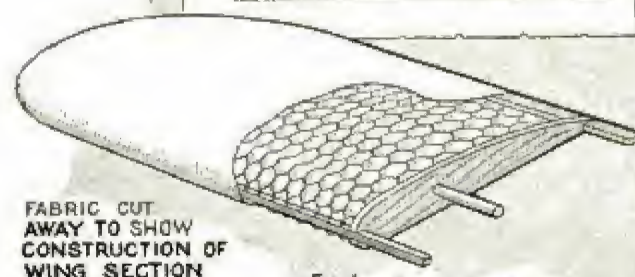
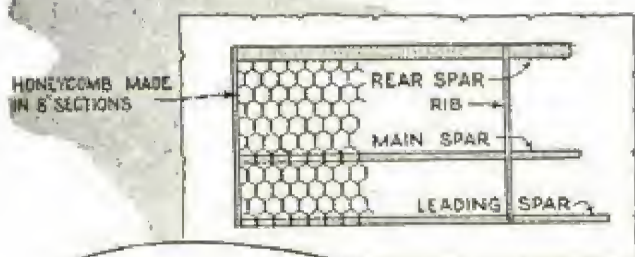


Fig. 1

SLOTTED TIN GUIDE INSURES UNIFORM WORK IN GLUING

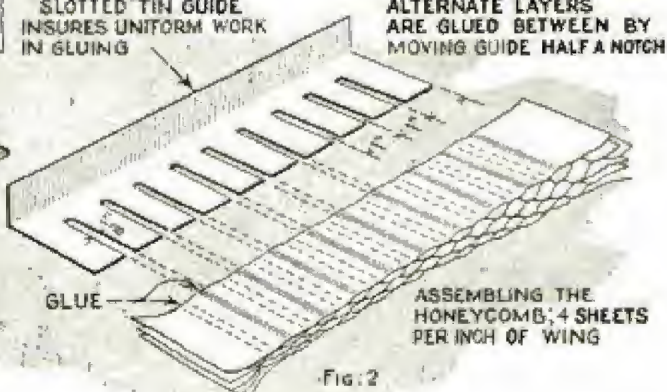
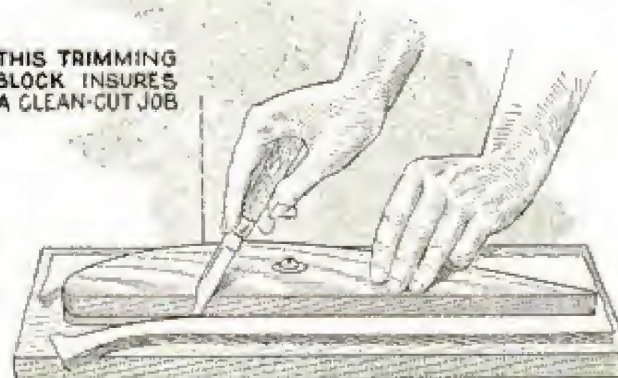
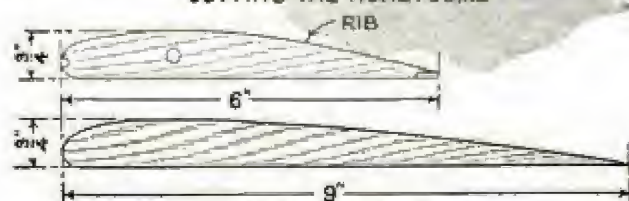


Fig. 2

THIS TRIMMING BLOCK INSURES A CLEAN-CUT JOB



CUTTING THE HONEYCOMB



TRIMMING BLOCK

Fig. 3

comb permits pressing down on the patch. The cellular construction demands careful workmanship, but no more so than the multi-rib design. It is, however, best adapted to the larger models with wings of 5-in. chord by 30-in. span and up.

First of all, bear in mind that this is

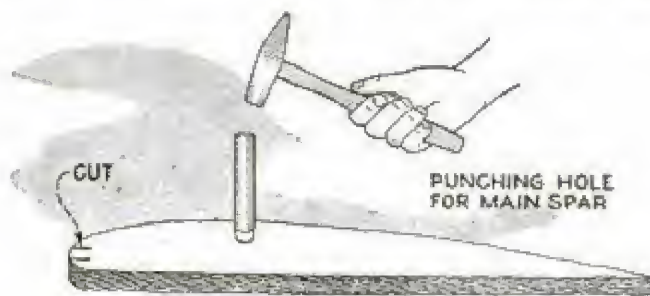


Fig. 4

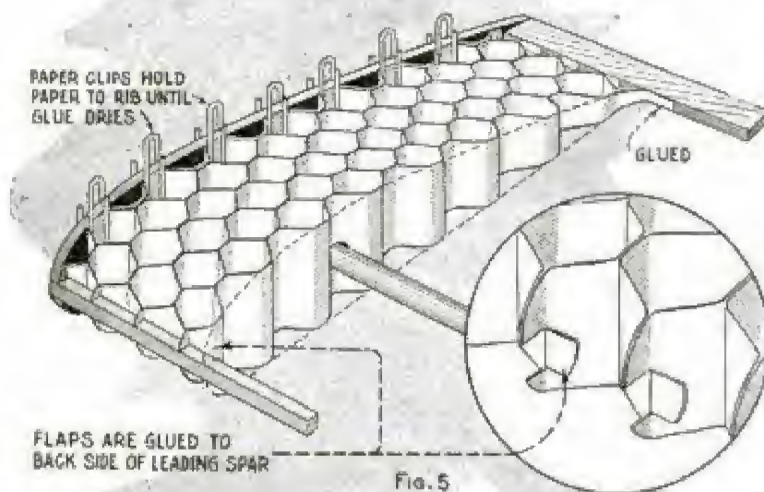


Fig. 5

gluing guide, as shown in Fig. 2, either of tin or pasteboard. This insures uniform gluing, though after some practice one can glue better and faster freehand.

Cut out 32 strips of paper, 10 in. long by $1\frac{1}{2}$ in. wide. This is just enough for one 8-in. section, there being four paper strips per inch of wing length. Cover strip No. 1 with the guide and glue through the slots. Use a small pointed brush, such as a water-color brush, and apply a thin line of glue, just enough to stick securely. Too much glue will squeeze out over a larger area and affect the symmetry of the honeycomb.

Now lay paper strip No. 2 on this, and move your guide along half a space, so that the small notch in the guide will be even with the end of the paper strip, and apply the glue. The idea is to have the glue lines on each successive strip come between those on the sheet below. Press down on the glued portions every three or four strips. When the section of 32 sheets is completed, allow the glue to dry thoroughly.

Trimming the honeycomb is next. This is most easily accomplished by making a trimming block, Fig. 3, which can be screwed down on a flat board. The trim-

ming block has the same shape as the rib, but is $1\frac{1}{2}$ times its length. For instance, the trimming block for the 6-in. rib should be 9 in. long, but the same depth, and the holes in both should be one-third the distance from the front. Sharpen your knife well.

Make a punch, the size of your main spar, by filing the end of a piece of tubing to a cutting edge. Punch holes in the honeycomb by laying the strips on a heavy block and driving the punch through with a hammer. See Fig. 4.

Having trimmed the honeycomb pad to the elongated rib shape, stretch it out gradually, a little at a time, until it will stay approximately in its final shape. Assemble the spars to the end rib, securing them with glue and pins, cut to about half their length, using the headless ends. Slip the honeycomb over the main spar and glue one end to the rib, holding it with paper clips. Fig. 5, until dry.

Next fasten another rib, 8 in. from the end. Glue the other end of the honeycomb to this. The front ends of the honeycomb are fitted over the leading spar and the flaps glued to the back of the spar. The rear tapering ends are folded at right angles and glued to the front edge of the rear spar. We repeat, patience will be required to do this well, but the results are worth all the pains you take. The same process is followed with the remaining sections.

With the honeycomb in position, firmly glued and dry, you can put on the fabric. Japanese rice paper is good material and easy to handle, and thin silk even better, if you know how to stretch it tightly. Glue your paper first to the front edge of the leading spar, pull firmly over the top surface and glue on underside of rear spar, as well as to the edges of the ribs, drawing it tight on all sides. Glue the bottom surface to the bottom side of the rear spar. When completed, you will be pleasantly surprised at the smoothness and graceful contour of the wing.

The same construction can be applied to tapering wings, that is, those which

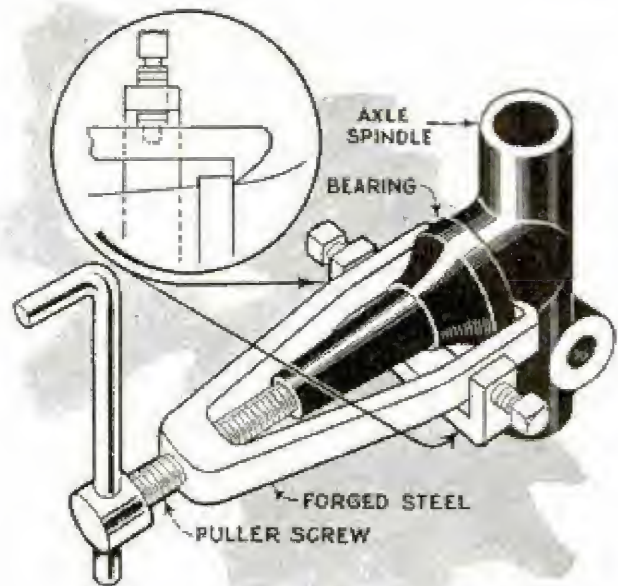
have a narrower chord at the wing tip than at the body, by contorting the honey-comb. This article, however, is not intended to illustrate the best proportions of the wing; that depends entirely on the type of plane you are building. Here we are concerned only with the cellular construction.

Method of Building Up Broken Parts in Welding

When it is necessary to repair a broken part by oxyacetylene welding at a point where there is a hole or opening in it, as for instance a crank, and some metal around the hole has been lost, it is an easy matter to build it up in the following way: Get a piece of carbon rod that is a little larger than the hole in the broken part and grind it down to fit the hole snugly. Then begin to weld to the broken edges and work toward the center until all the parts meet and are as heavy as the surrounding metal. The welding will not adhere to the carbon and the carbon will not melt. When complete, pull out the carbon, and the repaired part will be found as good and strong as it was before it was broken.—W. C. Loy, Rochester, Ind.

Substitute for Small Nut

It is often rather difficult to replace a small nut of odd size and thread, but a good substitute can be made from the end of an old film spool (which is easily procured). The end having the hole, not the key slot, is used for this purpose. Cut the spool close to the ferrule and bend the metal flange up, to form a thumbnut as shown. It is an easy matter to turn this nut substitute on the threads of the screw or bolt. The wood catches the thread and it is held from spreading by the crimp of the ferrule. You will find this entirely satisfactory.—F. W. Bentley, Jr., Missouri Valley, Iowa.



Tool for Pulling Force-Fitted Bearings from Auto-Axle Spindles

Tool for Removing Bearings from Axle Spindles

Force-fitted bearings on the front-wheel spindles of autos are difficult to remove, and the usual gear pullers are not serviceable for this work, as the bearing rests close to the shoulder of the spindle and only the edge can be gripped by the puller. Where much of this work is done, it will be found worth while to make a special puller like that shown in the illustration. The body is a steel forging having hook jaws to engage the edges of the bearing. A clamp is provided to straddle the jaws of the tool to prevent them from spreading. Setscrews are used to hold the clamp to the jaws, small depressions being drilled in the latter to receive the ends of the setscrews. The body of the tool is drilled and tapped for a puller screw to which a small crank is attached. Turning the crank causes the tool to pull the bearing off with very little effort and without distorting the ball races.—G. A. Luers, Washington, D. C.

SHOP NOTES IN BOOK FORM

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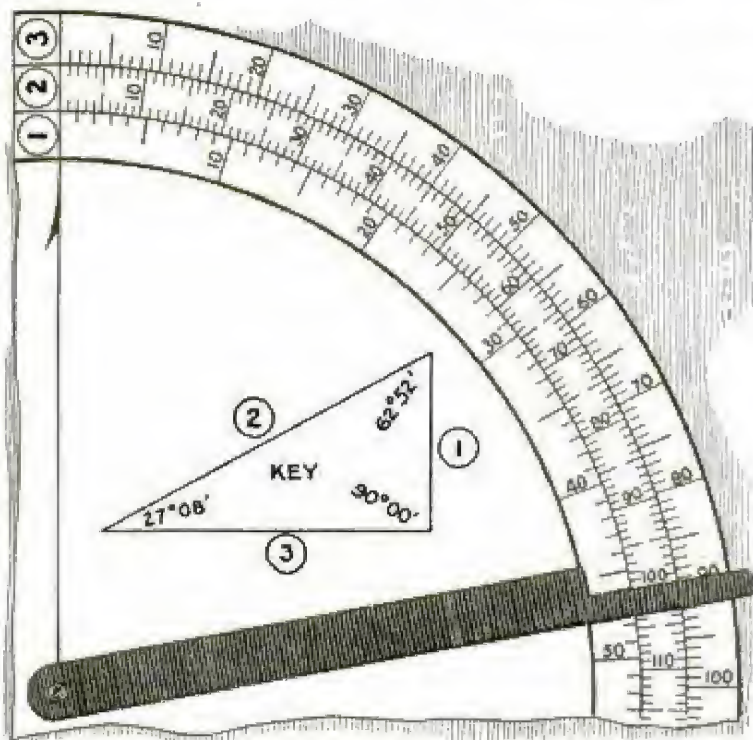


Table for Engineers and Draftsmen Who Have Many Angles to Be Checked on the Same Bearing

Simple Instrument Aids Draftsmen's Work

Having from 300 to 600 angles to check every three months, I have found the protractor shown in the illustration quite a timesaver. It is laid out on a circle having a radius of 8 in. The arm is pivoted at the exact center of the circle, and checks within .1 to .2 ft. Any person or concern having many distances on the same bearing should find it worth while to construct a table of this kind adjusted to their particular requirements.—D. W. Wetzel, Huntington, W. Va.

Pails Help Irrigate Orchard

As he did not wish to go to the expense of a cement-pipe overflow system, a California orchardist hit upon the idea of using a dozen ordinary galvanized-iron pails for irrigation purposes. He punched holes in the sides of the pails and soldered on adjustable spouts as shown in the photo. The pails can be set anywhere and at any distance from



Pails Provided with Adjustable Spouts Help Irrigate Orchard

the hydrants by using garden hose. They are removed after the irrigation.—Malcolm J. Rogers, Escondido, Calif.

Care of Oxyacetylene Tips

Blowpipe tips should always be kept free from dirt and other foreign material, for if this gets into the orifice or other passages, it prevents the free flow of the mixed gases in the right proportions necessary to produce a steady, neutral flame. Tips should therefore be held far enough away from molten metal so that the end of the inner cone just clears it. Smoky acetylene flames blacken the tip, and the carbon thus formed will in time clog the opening. To prevent this, welders should never light their blowpipes with only the acetylene

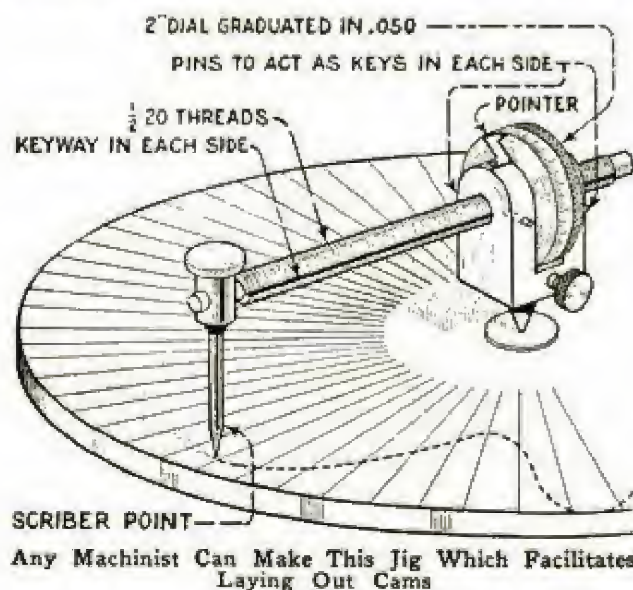
turned on. A small quantity of oxygen should first be let out and then the acetylene turned on. Many operators file the blowpipe tip down when it becomes ragged and picks up metal from welding, but this practice is not advisable, as it alters the length of the tip and this, in turn, affects the adjustment of the flame. If back fire occurs, which is often caused by the tip touching molten metal, by dirt in the orifice or by a loose head, the blowpipe is likely to be burned and consequently damaged. Therefore, when it does happen, close the oxygen valve immediately and keep it closed a few moments before relighting the tip. Neglect is the chief reason for dirty tips. Never allow them to lie around on the welding table, bench or floor. Keep them in a clean box especially provided for this purpose. As the

tips are usually made of copper or brass, which are much softer metals than steel, extreme care must be taken when cleaning the orifice. Never use a nail, file tang, needle or similar metal tool for this purpose, as this may

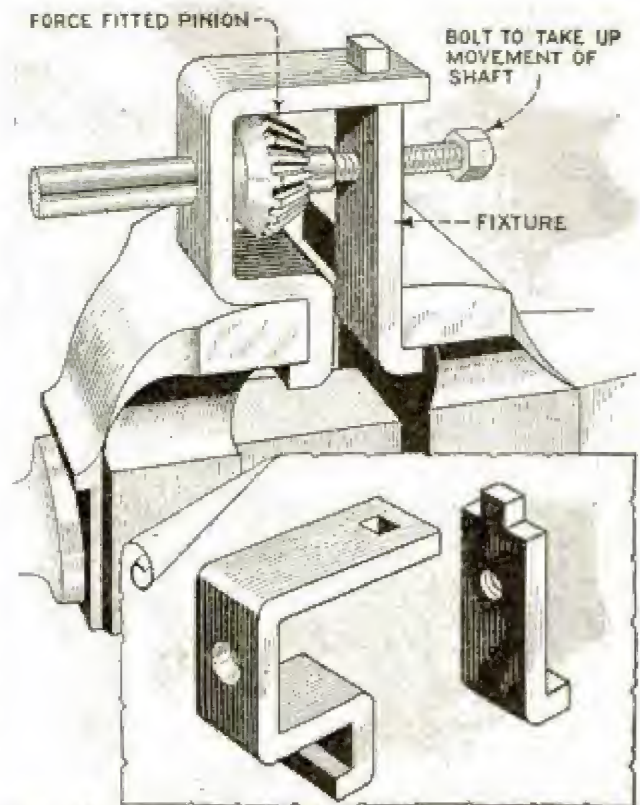
enlarge the hole and damage the tip. Only soft copper or brass wire should be used for cleaning and, even with this, care must be taken; the wire should be free from kinks and the end should be blunted so that it will not damage the orifice wall. Pliers, alligator wrenches or other wrenches with rough jaws should never be used to remove the blowpipe tips. Keep a small wrench on hand for this purpose. Occasionally the tips must be adjusted, but do not tighten them while hot, as the threads are likely to be stripped.

Jig for Layout of Cams

The illustration shows a simple jig which has been found very convenient for laying out cams for Brown & Sharpe automatic screw machines. In principle, it is a trammel with micrometer adjustment. Anyone who is experienced with the B. & S. machines can readily see the advantage of this device. It consists of a horizontal screw, $\frac{1}{2}$ in. in diameter, having 20 threads to the inch and a dial on the screw, the dial being graduated in .05 in. A keyway is cut on each side of the screw, and pins are set in the frame holding both screw and dial, the pins running in the keyways to prevent the screw from turning. An adjustable scriber point is attached to the other end of the screw, while an adjustable trammel point is fitted to the dial frame. The first layout marks, of course, are made



on the radial lines, the cam contour being afterward scribed as indicated by the dotted line in the drawing.



Vise Fixture for Removing Force-Fitted Pinions from Shafts

Fixture for Removing Pinions from Shafts

Force-fitted pinions, such as those on automobile driveshafts, should never be removed with a hammer, as the driving swells the end of the shaft and makes the final removal difficult if not impossible without filing down the shaft. A special fixture for doing the work without damaging the shaft is shown in the illustration. It consists of two forged steel parts, made to the shape shown. The smaller part is tapped to receive a bolt. The shaft is slipped through a hole in the other part, and after the two are hooked together, the bolt is driven up against the end of the shaft. By compressing the vise in which the fixture is set, the pinion can be forced off the shaft.

Reaming Brass and Bronze Bushings

Under no conditions should one attempt to ream a brass or bronze bushing with a reamer used on iron and steel. The cutting edges of the brass and bronze reamers must be specially ground, and the manufacturers will do this at a slight, if any, extra cost. It is false economy to use one reamer for different classes of work.—R. L. Simons, St. Paul, Minn.



These Containers Are Made from Sections of Inner Tube Stretched over Four Nails

Small Containers Improvised from Rubber Bands

When one needs several trays or boxes to hold small parts temporarily, while working on a machine, the improvised containers shown, which are made from rubber bands, will be found useful. Simply drive four nails into a piece of $\frac{1}{2}$ or $\frac{3}{4}$ -in. wood and stretch a 1-in. section of inner tube around them. The nails must, of course, be spaced apart to suit the size of inner tube to be used. Several containers of this kind can be mounted on a piece of wood about a foot long.

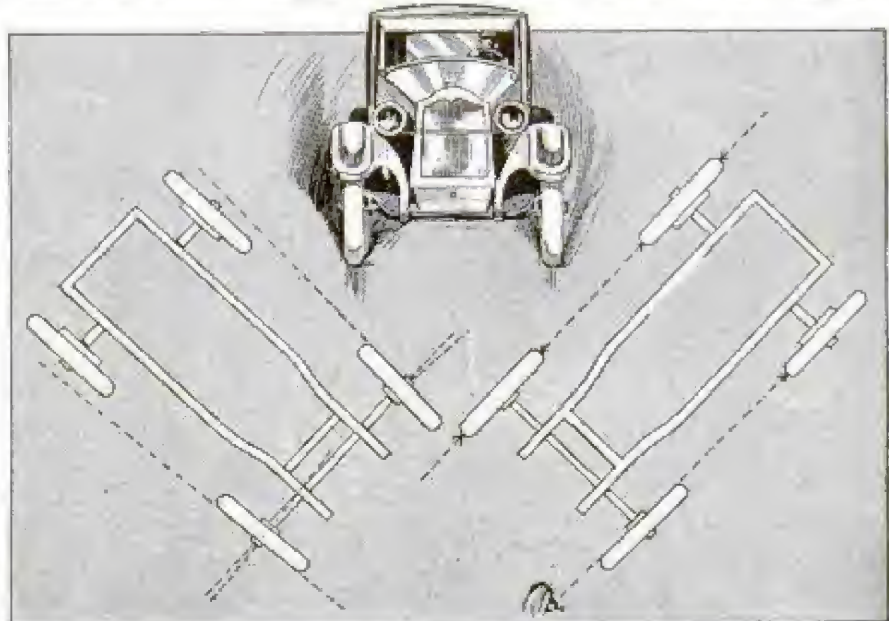
Preserving Fence Posts

While visiting on a farm, I witnessed a very effective method of preserving wooden fence posts. The ends of the posts, which were to be put into the ground, were soaked in lime water. Next they were dried and painted with diluted sulphuric acid. The posts became as hard as stone. My farmer friend showed me some fence posts that

had been in the ground for 25 years. Apparently their condition was as good as the day that they had first been put in. Only thoroughly dry posts should be treated in this way.—Vernon V. Johnson, Spokane, Wash.

Alining Auto Wheels

Thousands of cars are losing from 5 to 20 per cent of their efficiency because the front wheels are not in alinement, and this condition also causes excessive wear on the tires. Trouble also is experienced from too much "camber," a term which indicates that the front wheels are leaning out at the top. This has the effect of reducing the strain on the "stub," or steering, axles in a vertical direction, and in the direction of thrust. When the axles are cambered in this way, they would, if unrestricted, run in circles. With the usual 3 to 5° of camber, the circles would be large, but circles none the less. You can picture the circle if you imagine the axle continued down to the ground in a case of excessive camber. If you care to make a simple experiment, you can demonstrate this readily. Stick a long axle through a wheel, and try to roll it along on a straight line while leaning it over to one side. You will find that you can only do this by dragging it sideways unless you set the axle at an angle to the line you wish to roll it, which is not the 90° angle of a vertical wheel. This experi-



If the Front Wheels of Your Car Are Not "Toed In" Properly, Loss of Power and Excessive Tire Wear Will Result

The ends of the posts as far as they extend underground should be immersed in the solution

ment shows that as the wheels are cambered in opposite directions, the angles of the wheels will also be opposite, and the result will be that they will be "toed in." Although this condition is necessary, you cannot be generous by giving more, to get better results. That would be as bad an error as too little. Wheels should be toed in not more than $\frac{3}{8}$ in. each for best results. In a test, an electric car would make 82 miles on a freshly charged battery, the result being accurately checked on meters, while a maximum of only 62 miles could be obtained if the front wheels were set perfectly parallel instead of toeing them in. If you suspect a wobble in a wheel, jack it up and spin it around, using a piece of chalk to mark the high spots. The detail at the left side of the drawing shows the front wheels toed in about three times the normal distance. The left side of the right-hand detail shows the front wheel lined up true with the rear wheel, and the right side the correct angle of toeing in the front wheel, the dotted line passing along the inside edge of the front wheel and ending at the center point of the rear wheel. Sighting along the wheels can be resorted to if a straightedge is not available.—R. W. Youngash, Vancouver, Can.

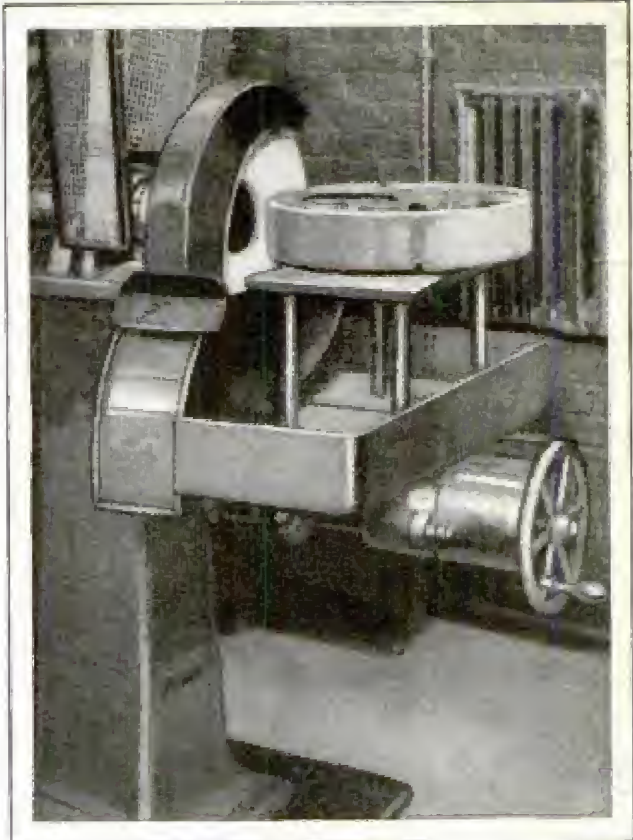
Gauging Size of Ball without Tools

The writer wanted several extra balls for use in an oil-feeding device. He had no tools to take the measurements, and the feed could be stopped for only a few minutes at a time. A wad of tinfoil was made and the ball firmly pressed into it as shown. Stock balls of various sizes were dropped into the depression thus formed until the correct size was found.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

¶To keep tools from rusting, apply a hot solution of benzine, 10 oz., and white wax, 5 oz., with a brush.



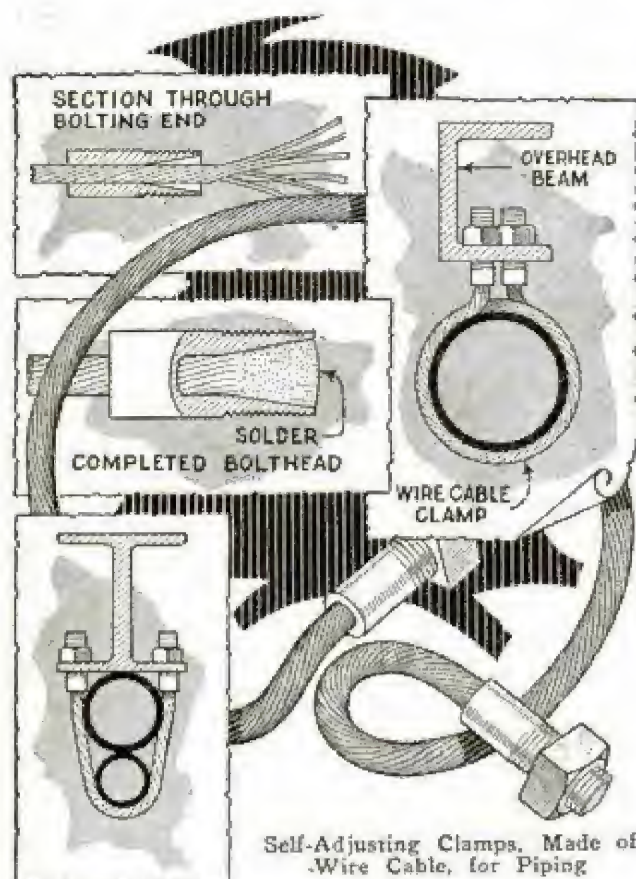
Taking an Impression of a Steel Ball in a Wad of Tinfoil



Jig Used in Brake-Service Station for Surfacing New Brake Lining

Surfacing New Brake Lining

Although new brake lining may be perfectly smooth before it is applied to the brake bands, the drilling and countersinking of the holes and the subsequent riveting cause the surface to become uneven, and this entails some trouble in getting the brakes properly adjusted. The uneven places soon wear down and it is then necessary to readjust the brakes. In one shop the linings were surfaced before the bands were installed by using a simple jig in conjunction with the grinder, as shown in the photo. The band, with the lining attached, is pivoted on a pin on top of a small table, set on a special mounting which can be moved toward and away from the emery disk. It is adjusted so that the wheel just takes off the high spots when the band is rotated against it.—A. E. Granville, La Grange, Ill.



Clamps Made of Wire Cable

Clamps of the U-type, used for fastening overhead piping, are more or less inflexible and require special fitting, which often necessitates forge work. In cases where a solid U-clamp is used over several pipes, or where the piping is run diagonally to the support, there is considerable work and time lost in making the clamp conform to the irregular shape of the piping. A clamp that saves time and adapts itself to the shape of the piping, can be made up of steel cable, as shown in the drawing. Cold-rolled-steel thimbles are drilled and threaded for the cable, which is cut to length and is fixed in the conical ends of these thimbles with lead. To do this, the cable is drawn through, the ends are bent slightly to separate the strands, whereupon the cable is pulled back flush with the

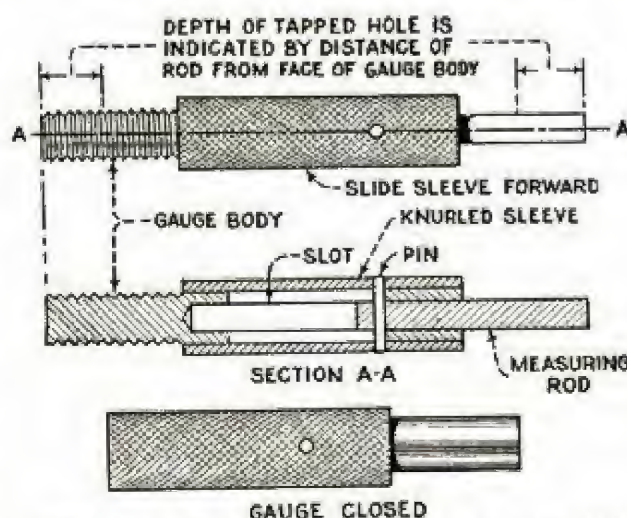
thimble and molten lead is poured in. The details show how a clamp of this kind is used.—G. A. Luers, Washington, D. C.

Carrying Ladders on an Auto

If you have occasion to carry a ladder or a long pole on your pleasure car, a good method is to hang the ladder or pole underneath it. It is entirely out of the way and there is no risk of marring the finish. A painter who uses his sedan for his work carries his ladders in this way and has provided special wire hooks on the front and rear axles so that the ladders can be put on and taken off quickly.—Glen F. Stillwell, Canton, Ill.

Depth-Indicating Thread Gauge

A thread gauge that not only gauges the thread but also indicates the depth of a tapped hole is a timesaving tool for many kinds of work. A hole may be drilled much deeper than necessary, but if the tap is not run in far enough it is useless. It is difficult to measure the depth of tapped holes of medium size in the ordinary way, and a gauge of this kind will be found handy. To make one, the thread and gauge body are of equal length and a knurled sleeve is made a sliding fit. The body is drilled from the back to take the measuring rod, which has a pin driven through it that slides up and down in a slot in the body and is a tight fit in the sleeve. When all parts are assembled, the end of the sleeve and the thread are flush, and the end of the measuring rod is flush with the body at the other end. Thus, when the thread gauge is turned into a piece, the sleeve is pressed back and the rod protrudes the same distance, so that the depth that the gauge has entered can be measured on the rod. When the gauge is not in use, the sleeve is pushed forward to protect the threads.



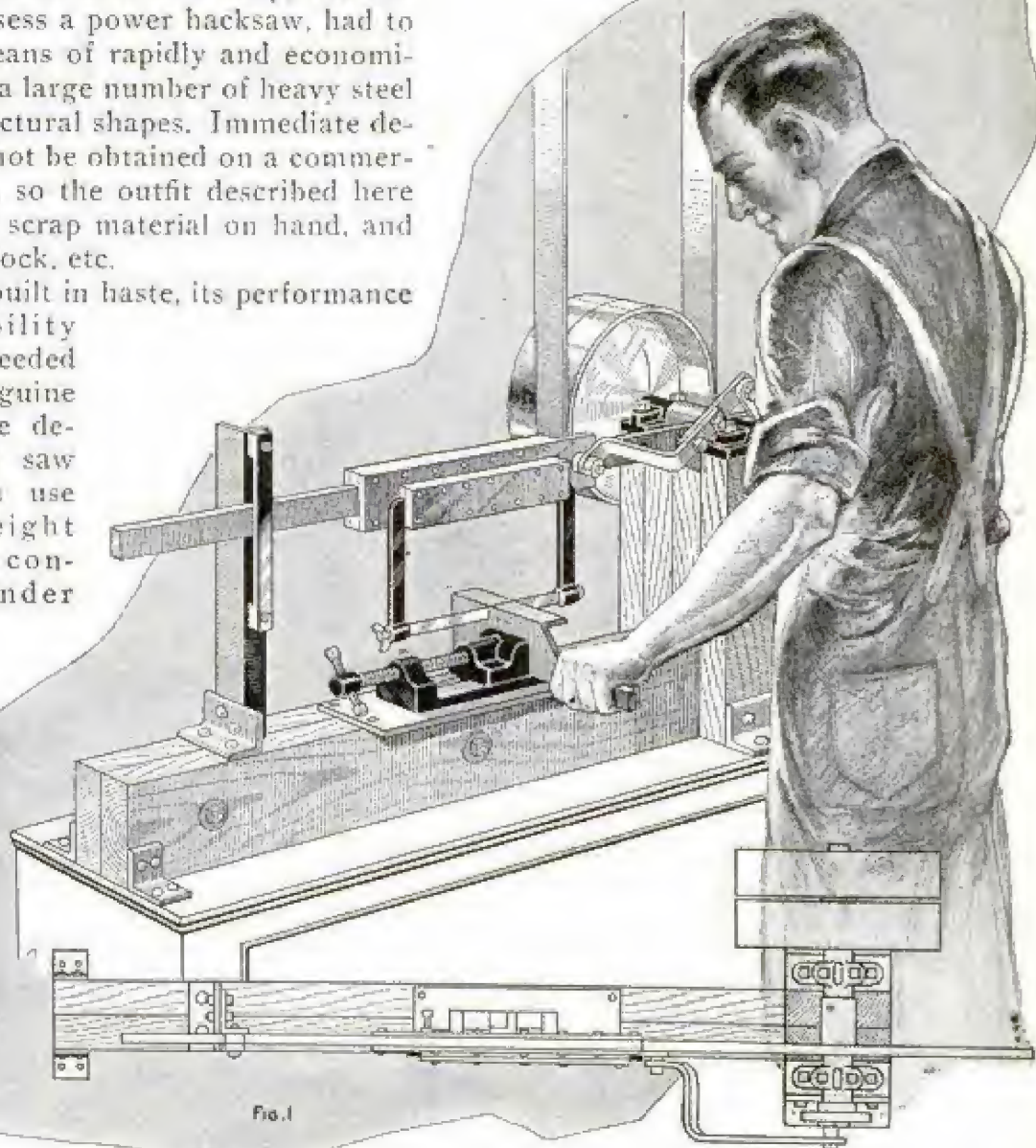
Thread Gauge That Indicates Depth of Tapped Hole Besides Gauging the Thread

Power Hacksaw *for* Small Shops

by Paul Leo

SOME years ago, the writer, who has a small experimental workshop, but did not then possess a power hacksaw, had to find some means of rapidly and economically cutting a large number of heavy steel bars and structural shapes. Immediate delivery could not be obtained on a commercial machine, so the outfit described here was made of scrap material on hand, and cold-rolled stock, etc.

Although built in haste, its performance and durability have far exceeded the most sanguine hopes of the designer. The saw has been in use for over eight years, and continues to render



most satisfactory service, never having cost a cent for repairs.

Fig. 1 shows a perspective view and plan of the machine. The bed or frame shown, which is detailed in Fig. 7, is made of straight, seasoned spruce, dressed to 2 by 6 in., the bed proper being made of two 4-ft. lengths. The uprights at the rear are of the same stock, the outside pieces being 16 $\frac{3}{8}$ in. long and the filling pieces 9 in. In cutting, it is desirable to use a miter

box, to insure squareness. It is also advisable to clamp the pieces together solidly before drilling for the bolts. When drilling the holes in the bottom of the uprights, it is better to locate them from the holes drilled in the angle-iron feet (Fig. 4), which are 6 in. long.

The bearings for the 1-in. shaft are known as common flat babbitted boxes, and may be obtained from any dealer in mill supplies for about 70 cents apiece.

holes are drilled as shown and tapped $\frac{3}{8}$ in., U. S. S. thread, for the $\frac{3}{8}$ -in. cap-screws that hold the crank arm shown below the flange. Drill and tap the flange hub for a $\frac{5}{16}$ -in. setscrew. The crank arm is a straight piece of $\frac{3}{8}$ by 1-in. cold-rolled stock, $6\frac{5}{8}$ in. long. Drill for the cap-screw as shown, and drill a $\frac{1}{2}$ -in. hole for the crankpin. The latter is detailed in Fig. 6.

The vertical guide for the slide bar is detailed at the left in Fig. 2, and consists principally of structural shapes. The construction is quite clear from Figs. 1 and 2, but be sure that the spacers are so set in as to allow the slide bar an easy fit. The guide is secured to the bed with $\frac{3}{8}$ -in. lagscrews, and care must be exercised to keep the vertical member square with the foot, and also that the slide bar is maintained parallel to the bed.

The slide box, Fig. 8, which includes the clamp for the saw frame, is built up of $\frac{1}{4}$ by 3-in. cold-rolled stock, held together with $\frac{5}{16}$ -in. stove bolts. The spacers, forming the top and bottom, are of $\frac{1}{2}$ by $\frac{5}{8}$ -in. stock, $15\frac{1}{2}$ in. long. Select cold-rolled stock as straight and true as possible, and remove all burrs. Fit the assembly carefully to the slide bar, making witness marks on all pieces, and make sure that it slides freely on the bar, but without play. The small box that is the clamp for the saw frame is formed in a similar manner to the main slide box. The saw frame used by the writer is a Starrett No. 148,

with the handle removed. This takes work, $7\frac{1}{4}$ in. deep from teeth to inside of frame, and uses 12-in. blades. The frame stock is $\frac{1}{4}$ by 1 in., and is very rigid. See that the top plate on the saw box clamps the saw frame firmly in place. The forward end of the connecting rod pivots on a steel bushing and screw, shown in Fig. 6. The screw is driven from the back into a countersunk hole drilled for it in the slide box, at the right, and a nut run down tight on it. When the connecting rod is assembled, the bushing is slipped on, then the rod, and last another nut to hold the rod in place.

The connecting rod is made in two pieces, as shown in Fig. 5. The bend in the offset piece is made $5\frac{1}{8}$ in. from the end. The two sets of three holes each seen in the offset part are drilled to correspond to the two bolt holes in the straight bar, and allow some adjustment in the position of the saw frame in relation to the work.

The vise used is a Yankee No. 990 drill vise, costs about \$3.30, and is fastened to a $\frac{1}{4}$ -in. steel plate as shown, the plate be-

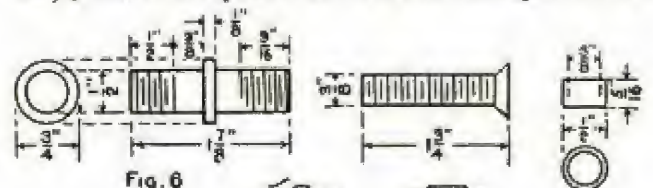


FIG. 6

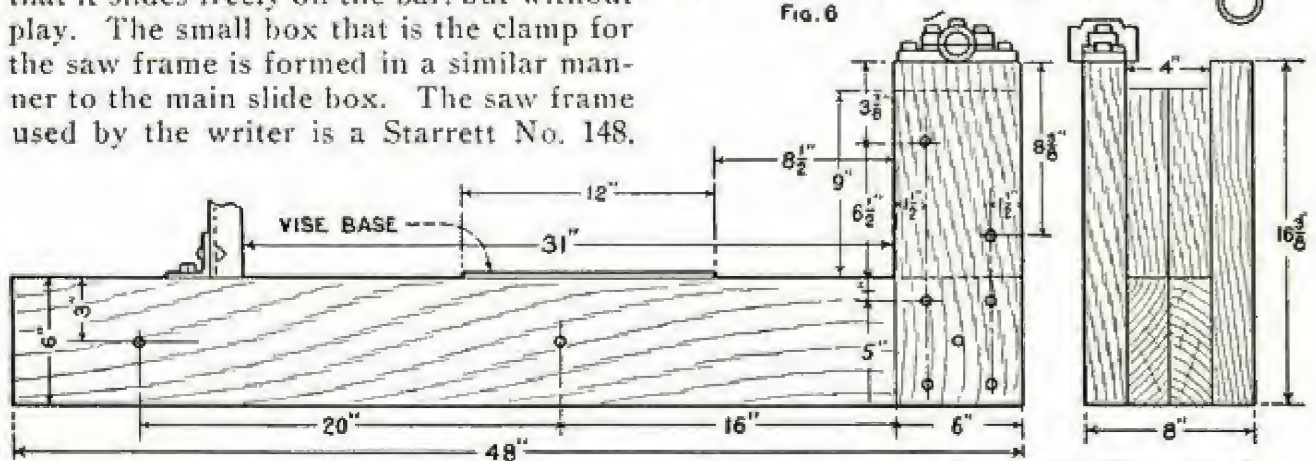


FIG. 7

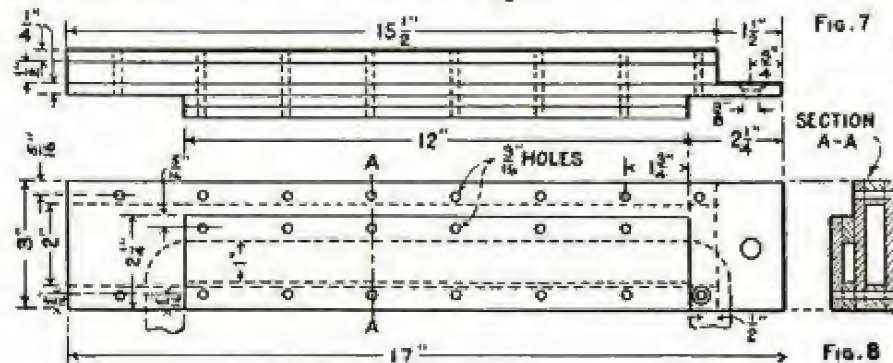
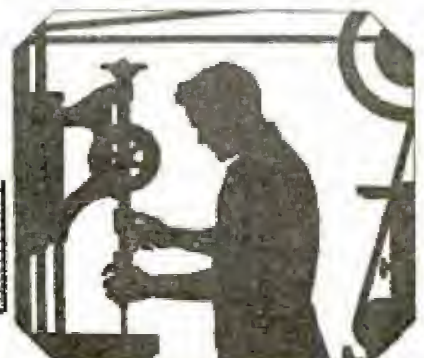


FIG. 8



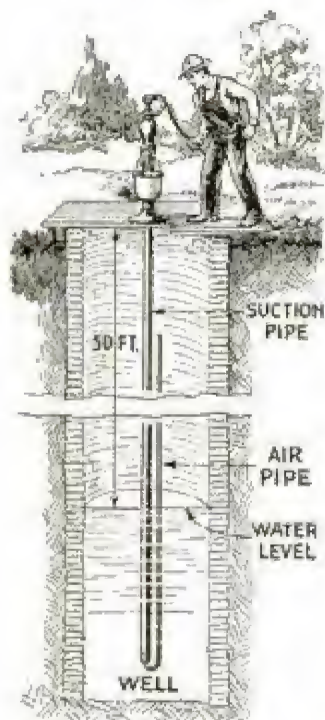
ing screwed to the machine bed. Leave $\frac{1}{4}$ in. between the edge of the vise jaws and the saw blade.

Four 10-lb. sash weights may be hung with S-hooks to the $\frac{1}{2}$ -in. holes drilled in the rear of the slide bar. The number and position of these weights govern the bite of the saw, more bite being needed for brass and soft material, for wide stock and also when the blade is dull. Less bite

is needed when the stock is narrow and also when the blade is sharp. Work should always be gripped in the vise so as to present the widest possible surface to the teeth of the saw. Light pressure should be used on new sharp blades.

A tight and loose pulley complete the machine. Belt the machine so as to produce a speed of not more than 50 strokes per minute.

Increasing the Lift of a Hand Suction Pump



Theoretically 34 ft. is the maximum lift of an ordinary house or farm hand-suction pump. The illustration shows how the lift can be increased from 15 to 20 ft. without using an air-lift pump, although the principle of the latter is used. A small pipe, having an internal diameter of $\frac{1}{4}$ or $\frac{3}{8}$ in., is fastened to the suction pipe, one end of the pipe being al-

lowed to project above the water level in the well, and the other end bent upward to project into the suction pipe as indicated. When the pump is worked rapidly, some air is drawn down the small pipe into the suction pipe, the column rising in the suction pipe being a mixture of air and water the density of which is less than that of water. To operate successfully, it is necessary that the speed of the pump plunger shall be greater than the speed of ascension of the air bubbles.

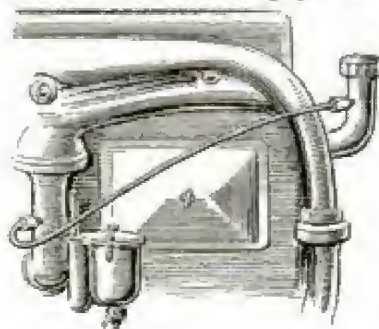
A Protection for the Acid Bottle

The bottle used as a container for nitric acid, that is kept in a shop for etching steel, is subject to being struck with some piece of metal and broken. As this is a dangerous acid when not confined, it is

well to be careful and use all caution possible in handling the liquid. A good safeguard is to glue a cardboard disk to the bottom of the bottle, then coat the outside surface with glue, and, when it becomes tacky, roll it in small particles of cork. The cork may be obtained from a dealer in imported grapes. When the glue hardens to hold the cork, it makes a very satisfactory guard against breakage.

Remedy for Engine Leakage and Clutch Troubles

Many cases of engine oil leakage and clutch troubles can be avoided by using a manifold attachment to the breather pipe, as shown in the illustration. A length of copper tubing with two screw connections is used for the purpose. The breather-pipe opening should be tightly closed, using a felt or leather washer under the cap. When the motor is in operation, the oily vapor that usually comes out of the breather pipe is drawn into the



motor and is burned along with the other fuel. The gasoline, that gets into the oil, vaporizes readily and is quickly drawn off, preventing oil dilution. In one case, this attachment rem-

edied oil leakage at the ends of the crankshaft, the oil finding its way into the clutch and causing slipping. Besides, the deposit of oil vapor on the motor is entirely eliminated.—G. A. Luers, Washington, D. C.



Does Insulation Pay

Copyright, Popular Mechanics

Plan 4-W-3

DOES insulation keep heat in and cold out? Are insulated houses warmer in winter and cooler in summer? Does insulation save on fuel? What are the facts?

Recent figures by the national lumber manufacturers association show the average house without special insulation and weather stripping loses twenty-five to thirty-five per cent heat through attic roof and ceiling; from twenty-five to thirty-five per cent through side walls, and from thirty to forty per cent around windows and door openings.

Figuring the lowest of these percentages you will see that as high as eighty per cent heat loss may occur in a house not insulated and not weather-stripped.

The United States



A SPECIAL OFFER

To help our readers get started on one of life's most glorious experiences—building and owning a home—Popular Mechanics Magazine will supply readers a one-sheet blueprint of this plan for \$1 (regular price \$2), if ordered before June 1. This blueprint does away with the necessity of first purchasing a complete set of plans to find out whether you can afford to build. It contains floor plans, elevations, a section detail, size of joists, studs, etc., and also a brief specification. Submit it to tradesmen and dealers for building estimates.



bureau of standards states that a one-inch insulation on side walls and roof and weather stripping applied to windows and doors may prevent as high as fifty per cent heat loss.

What do these tests mean to home builders? Just this: Dollars saved on fuel and increased comfort and health for the family.

Let us be specific and apply insula-

tion to the little house above. This is what may be called the average house. Under normal conditions it builds for something less than \$4,000. That price is the average for houses throughout the United States.

There are plenty of standard insulating materials for side walls and roof that would not cost more than \$100, possibly less, for this house. Suppose they reduce heat loss from twenty-five to forty per cent? To be on the safe side, let us say twenty per cent.

If it costs \$100 a year to heat this house without insulation and \$80 a year with insulation, you make a \$20 saving on fuel. This is profit that insulation earns you. It is a twenty-per-cent dividend on your \$100 insulation investment. There are mighty few gold securities that yield twenty per cent interest rate. In five years' time the insulation pays for itself. After that it goes on earning. There are other profit-making arguments for insulation, such as reduction in size of heating plant, decreased radiation, etc.

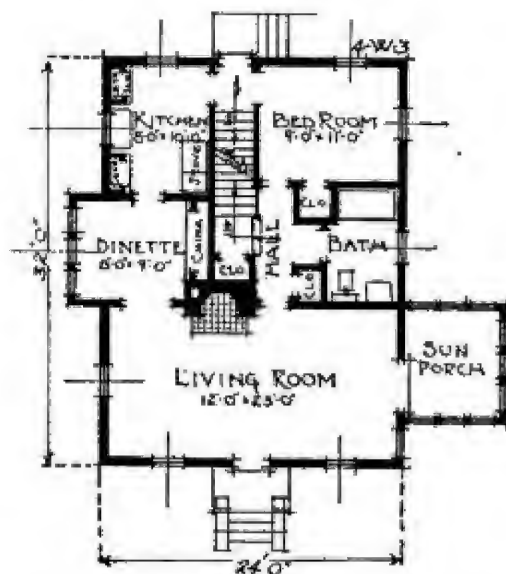
What about old houses? Can they be insulated? To a large extent, yes. Statistics show about forty-per-cent heat loss through the roof of an old house. Practically all forms of insulation can be applied to roof rafters or above the second-floor joists. You can do this work yourself. It is an easy way to save part of every dollar you spend for fuel. The time to insulate is now, when summer is at hand and new construction is going on. Remember there's no guesswork about insulation. You can put your finger on the savings.

The little house in this issue is easy to build, easy to live in and easy to pay for. Perhaps you can do some of the work yourself. It is not so large but what a handy man with an experienced carpenter could make a considerable savings in labor.

While one bedroom is shown down-

stairs, there is space for sleeping quarters on the second floor. Perhaps the sun porch may be used as a sleeping porch. The "dinette" is large enough for a small family. If you need more space for dining purposes, use one end of the living room.

You may not care to finish the second floor now. This would save money. On the whole, here is a compact yet roomy small house where every foot of space is used to excellent advantage. The construction is frame, fully insulated; wide-siding exterior; full basement; shingle roof, and the style is Colonial. It will cost \$4,000 in round numbers under normal conditions. If you can do some work



yourself, you may bring the cost down to considerably less.

Remember this about the cost to build: Costs vary, depending on where you live and the materials you select. Luxurious equipment costs more than simple equipment. For example, there are several grades of hardwood flooring. The lower grades cost less and, when finished or stained, they not only look well but wear well. Carry this principle through in your house and you will save many dollars.

To help you in getting costs, Popular Mechanics Magazine offers you an inexpensive blueprint service announced on the previous page. Use it. It saves you time and money.

PLAN BOOKS FOR READERS

A NEW BUNGALOW BOOK. Just off the press. Sixteen selected low-cost bungalows in popular styles. Latest space, labor and money-saving ideas. Bungalows actually lived in. \$5,000 and less. Some as low as \$2,000. Book is beautifully illustrated and each house fully described. Send 10 cents in stamps to cover postage. Address Building Editor.

TWENTY POPULAR LOW-COST HOMES and Ten Commandments for Home Builders and Home Buyers. Selected houses showing variety of types, styles, materials and sizes. All planned to fit average pocketbook. Some as low as \$2,000. Send 10 cents in stamps to cover postage. Address Building Editor.

Have you pride in ownership of fine tools?



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Chuck will
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Patented
quick cen-
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bearing. Any
bit, round,
square, any
taper, held
accurately.

This
"Yankee"
Bit Extension
holds bit
in socket.
No jaws to
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jam. Bit
can't loosen
in work;
can't pull
out of sock-
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brace. Fol-
lowsthrough.

"Yankee"
Bit Extension
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15", 18", 21",
24", \$2.25 to
\$2.40.

"YANKEE" toolmakers
served their apprentice-
ship long before the art of
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Their standard — now, and
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and efficiency that can be built
into a tool; the utmost saving
of time and labor for the user
of "Yankee" Tool!

The "Yankee" Brace is
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Its position in tool-dom is
like that of a fine car in
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things . . . appreciate pre-
cision and finish in tool-
making . . . understand
the long-run economy of
paying a little more for
quality and efficiency.

It is being bought on sight
by men who thought they
did not need another bit
brace. And by men mak-
ing sure they will never
have to buy another.

No. 2100. Four sizes: 8-,
10-, 12- and 14-inch. Price,
with 10-inch sweep, \$8.20.



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able hard
rubber
handle.
Steel clad.
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Famous "Yankee" Ratchet.
Dust-proof. Moisture-proof.
Quick, positive, easy acting
and VISIBLE "Yankee"
Ratchet Shifter.

Hard
Rubber
Handle

Two-jaw
Chuck Holds
 $\frac{1}{2}$ " round; $\frac{5}{8}$ "
square (across
corners).

"YANKEE" TOOLS

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NORTH BROS. MFG. CO., PHILADELPHIA, U. S. A.
Yes; I like to own fine tools. Send me "Yankee" Tool Book, illustrating Quick-
return Spiral Screw-drivers, Adjustable-tension Push Drills, Two-speed (11-
inch) Hand Drills, Ratchet Breast and Hand Drills, Removable-base Vises, Etc.

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Here is trade information on used car buying gleaned from experts who have spent years in gaining their knowledge. Some of this information is made public for the first time in "How to judge a used car." There are 32 pages of text, abounding in money-saving pointers on used car buying. Pictures illustrating many of these points make clear just what to look for in the used car you buy.

Can you tell anything from speedometer readings? Do you know what code prices mean? Can you tell the model year of a used car? How would you set a fair price on a used car offered by a friend? How do you avoid "orphans"? Get the answers to all these questions—and many more by sending the coupon below for your copy of "How to judge a used car."

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- 1** Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.
- 2** All Studebaker automobiles which are sold as **CERTIFIED CARS** have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.
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Dept. 156, South Bend, Indiana

Please send me copy of "How to Judge a Used Car"

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Street

City..... State

STUDEBAKER

Builder of Champions

How to Use a Circular Saw

Told by the World's Foremost Saw Makers

YOU know Disston as the maker of the great saws used in the lumber industry. And Disston also makes circular saws and band saws for you: for every type of portable rig and bench outfit. Small circular saws of the same quality as the 110-inch saws (largest in the world) made by Disston for cutting giant logs of the West Coast.

Small band saws of the same quality as the great Disston Band Saws famous among lumbermen for their hardness, toughness and temper. Saws made possible only by Disston Steel, from Disston's own steel furnaces. Ask for "Disston" Hand Saws, of course; but also Disston Circular Saws, Band Saws, Tools and Files.



Files for the Wood Worker

Disston Cabinet Files (fine teeth) for smoothing and finishing wood surfaces. Disston Wood Rasps (coarse teeth) for rough and fast cutting, enlarging holes, etc. Half-round 8" Cabinet File, 65c. Flat 8" Wood Rasp, 50c.



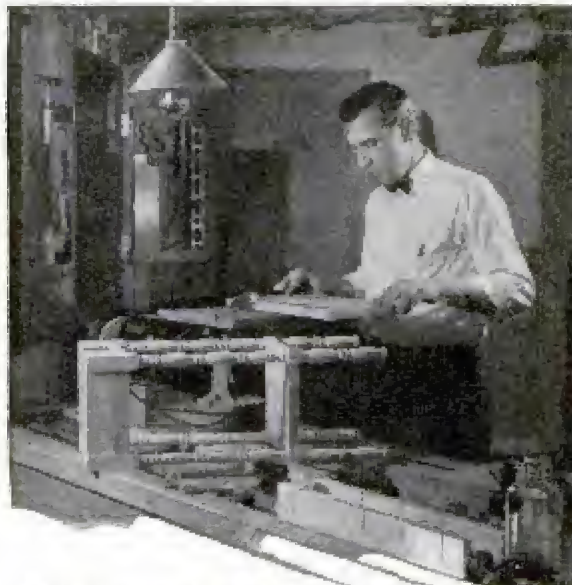
Handiest of Pocket Levels

For truing up construction work, levelling shelves, etc., use a Disston Featherweight Pocket Level. It is the lightest and handiest level made. Length, 9"; weight, 2 oz. Aeroplane aluminum. Three proved glasses, \$1.25.



For Cutting Dovetails, etc.

Wherever a fine joint is needed, and for careful cabinet work or pattern making, use a Disston No. 68 Dovetail Saw. Blade extra thin, with fine teeth. The 8" blade, 17 points to inch, is most popular, \$1.60.

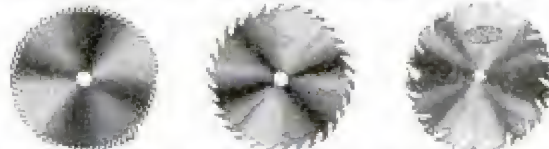


MAKE sure arbor hole in saw fits mandrel snugly and that collar and nut are tight, to prevent saw wobbling in the cut or turning on the shaft.

Before starting, see that saw has ample clearance at sides and ends of table slot. Test by turning by hand. If table can be moved up and down, set it so cut will come as near center of saw as possible. This gives best cutting angle on saws up to 8", and lessens tendency of material to "ride" over the top of the saw.

Get enough speed. Have belt tight. Don't adjust table when saw is running.

Stand to left, not back of, board to be cut. Hold down work with left hand, just ahead of right. Push work through with right hand. When gauge is close to saw, use a "pushstick," notched on the end. Do not "crowd" the saw: if it binds, ease up on the feed.



Use Disston Circular Saws for better work on any machine. Cross-cut (left), for cutting across grain; Rip Saw (center), for cutting with grain, or a Disston Combination Saw (right), which cross-cuts, rips and miters perfectly.

Your hardware dealer has in stock, or can get for you quickly, any size or style of Disston Circular Saw.

DISSTON

Makers of "THE SAW MOST CARPENTERS USE"



For Cutting Soft Metals

You can use a Disston Metal-Slitting Saw on your power outfit. Cuts sheet brass, zinc, copper, etc. Disston makes metal-cutting circular saws from 1/2" to 90" diameter. Write for information and prices.



Band Saws for Better Work

Disston "Thin Gauge" Narrow Band Saws are made 2 to 3 gauges thinner. They run better on machines with wheels up to 24" diameter. Saw 8" 8" long, 3/4" wide, 25-gauge, brazed, \$2.17. Other sizes in proportion.



"The Saw Most Carpenters Use"

The two handiest saws for the home work-shop are the 26-inch 8-point for cross-cutting, and the 26-inch 5 1/4-point for ripping. You will need these on almost every job. The popular "D-8" Lightweights cost \$3.45.



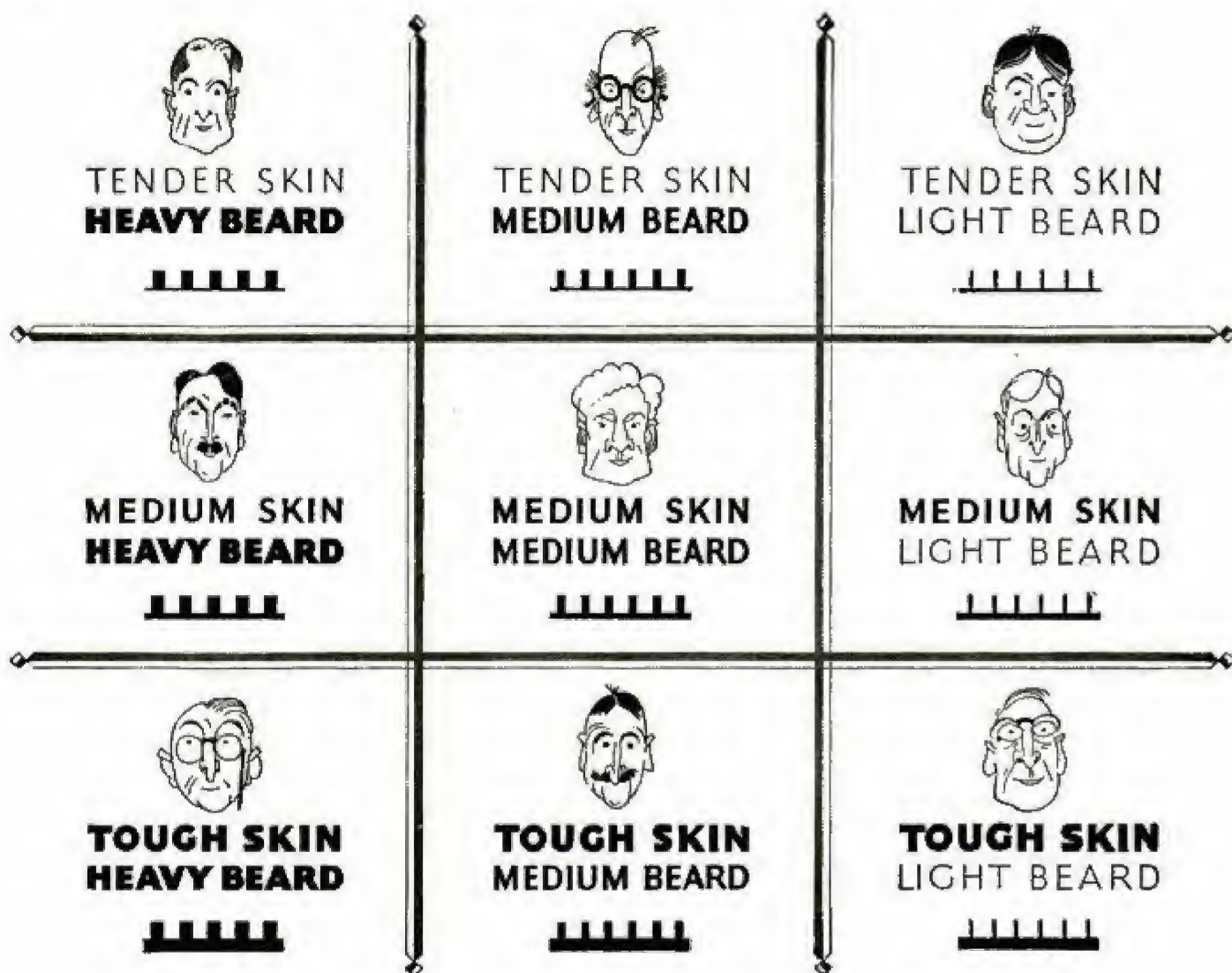
Every saw user will enjoy reading "The Disston Saw, Tool and File Book," an illustrated manual on the selection, care, and use of tools. It tells how to file and set saws, etc., and contains helpful information on circular saws. Use the coupon, or write for it.



Henry Disston & Sons, Inc., Philadelphia, U. S. A.
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Name and Address.....



Name your beard, gentlemen

BEARDS are past reforming. Blue and bristly or blond and silken, they're all hard to shave—at least you can't tell their owners otherwise.

We don't try to.

It's easier to put the burden on the blade; to use the best and most expensive steel and to spend, as we have, some \$12,000,000 in the past ten years to develop precise and delicate machines that hone and strop that fine steel far beyond the limits of human craftsmanship. It's easier to pay a bonus to workers for every blade they reject which

does not come up to the high Gillette standard.

True, it makes some difference whether your beard is heavy or silken, your skin sensitive or tough; whether the water is

hot or cold, hard or soft; whether you slept well or badly the night before.

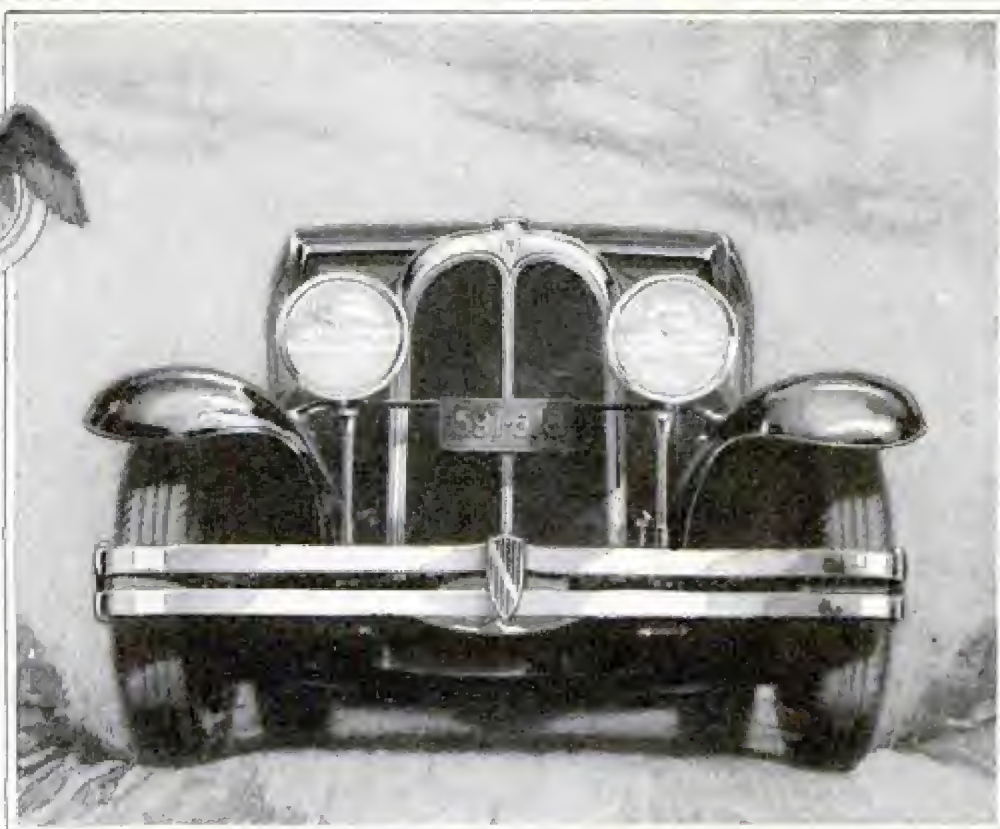
But even under the worst possible conditions you can count on the Gillette Blade to do its job smoothly, surely and well. It's the one constant factor in your daily shave. Gillette Safety Razor Co., Boston, U.S.A.



THE NEW FIFTY-BOX. Fifty fresh double-edged Gillette Blades (10 packets of five) in a colorful chest that will serve you afterward as a sturdy button box, cigarette box or jewel case . . . Ideal as a gift too. Five dollars at your dealer's.



Gillette

*Body by Fisher*

Brakes - another All-American feature that arouses owners' enthusiasm

In thick traffic . . . where quick, sure deceleration is imperative. On slippery pavements . . . where equalized action is the crying need. In hilly country . . . where ordinary brakes heat up and drag and even stall the engine. Under all these conditions the brakes of the New Oakland All-American have proved their superiority.

Internal-expanding . . . they are fully protected. Unaffected by mud or rain or ice. As a result they maintain their high efficiency in any weather. They are always positive and smooth in action . . . always exceptionally quiet.

Their design is extremely simple and

unusually free from "floating shafts," "compensators" and the like. No equalizers are required. Braking does not interfere with steering. No lubrication is needed and a single adjustment is good for 10,000 or more miles. Yes . . . Oakland's brakes are far from ordinary. But the same is true of everything else in the New All-American Six. Call on your Oakland-Pontiac dealer . . . and he will show you how much more it offers for its price.

Oakland All-American Six, \$1145 to \$1375, f. o. b. Pontiac, Mich., plus delivery charges

OAKLAND MOTOR CAR COMPANY
PONTIAC, MICHIGAN

The New OAKLAND *All-American Six*

PRODUCT OF GENERAL MOTORS

C & L 70

This is the Clayton & Lambert No. 70 fire-pot with tinner's hood. Produces a working flame in ninety seconds. Flame controlled as easily as a lamp. The burner orifice cannot be enlarged by tightening the needle valve. No chance of ruining the fire-pot that way—that's an exclusive C & L feature. Will heat a pair of soldering coppers and melt a pot of metal at the same time.

It does a lot in 90 seconds

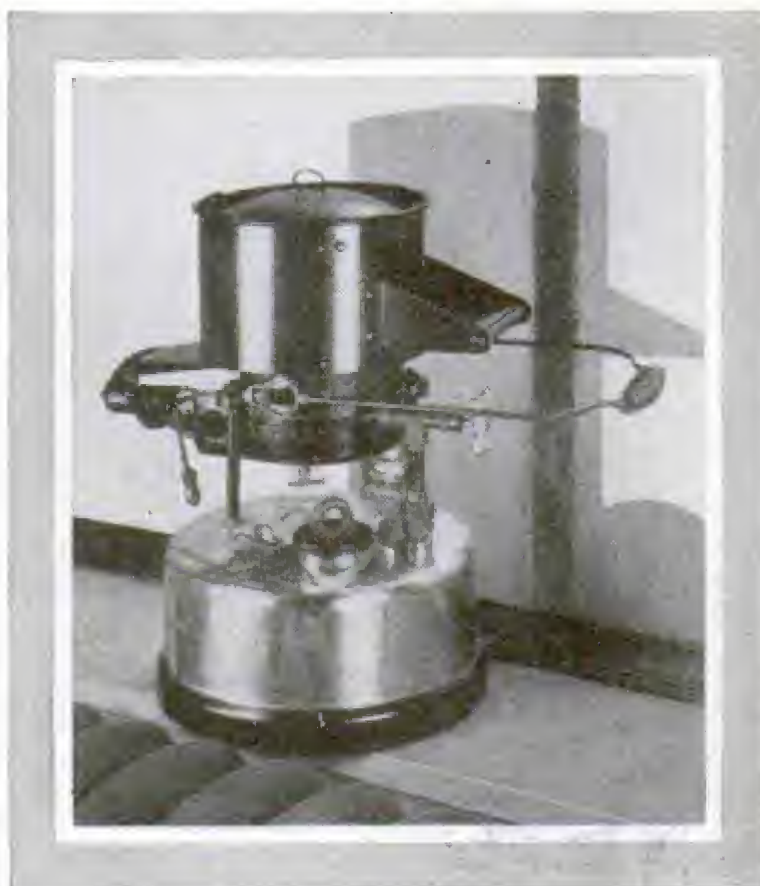
You can prime and light a Clayton & Lambert fire-pot and have a working-hot flame in ninety seconds! Then turn the flame down—retaining the heat—and watch the metal melt along with your fuel bill. That's what you do in ninety seconds with a No. 60 or 70 Clayton & Lambert. And you do it every time regardless of winds or draughts or cold weather. You can use them indoors without annoying a soul, for they're noiseless, odorless and smokeless.

Such quick, positive action comes from an exclusive Clayton & Lambert improvement. A unique method of mixing air and gas vapor in the proper proportions—*always*. That with the exclusive baffling cup assures rapid-fire starting. Another exclusive Clayton & Lambert feature is the "spider" welded to the tank. It keeps the top-structure properly aligned and all working parts in perfect true. And the uprights which give them additional strength are drop-forged and practically indestructible.

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happen the plate is easily replaced. Fire-pot No. 22, which is a powerful and popular coil type, has a feature that you'll appreciate. To remove the coil you loosen one nut and draw the coil through a door in the cup. That saves you a lot of troublesome work when the coil needs changing.

You're familiar enough with tools to know what these improvements mean. The satisfaction and longer service which they give have made Clayton & Lamberts the largest selling fire-pots in the world. For your greatest money's worth insist that you get a Clayton & Lambert. Look for the red band around the base of the tank. That's the sign of a Clayton & Lambert. But look for the C & L trade-mark too—just to be sure! Sold at nearly all hardware and electrical houses.



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EVEN among technically minded people, there are very few who realize the infinitely painstaking research which must precede any positive contribution to the improvement of a motor fuel.

Before Ethyl Gasoline was offered to the public, tests like the one illustrated were carried on for more than seven years in the Research Laboratories of General Motors.

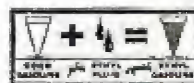
Then Ethyl was subjected to ruthless experimentation by the laboratories of the outstanding oil companies of the United States, Canada and the British Isles. Having proved its worth for

themselves, they now mix Ethyl fluid—containing tetraethyl lead—with their good gasoline to form Ethyl Gasoline.

The country-wide distribution of Ethyl has encouraged automobile manufacturers to build cars of higher compression. The combination of high compression engines and Ethyl Gasoline has created a new standard of motoring comfort and efficiency.

Whatever your car will do on ordinary gasoline, it will do better on Ethyl.

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ETHYL GASOLINE

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Rule Depth Gauge No. 615
with a rod

This depth gauge uses a 4" or 6" rule and also a 5/64" rod, especially desirable in measuring the depth of small holes.

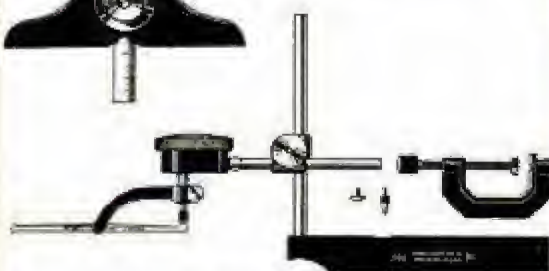


Toolmakers' Clamp
No. 756

Pieces that an ordinary clamp cannot hold are easily dealt with, thanks to the extra long jaw with its unique auxiliary screw.

Rule Depth Gauge No. 616

The blade of this new gauge may be adjusted to any angle, making a convenient protector of the tool. The six inch blade is graduated in 32nds and 64ths of an inch.

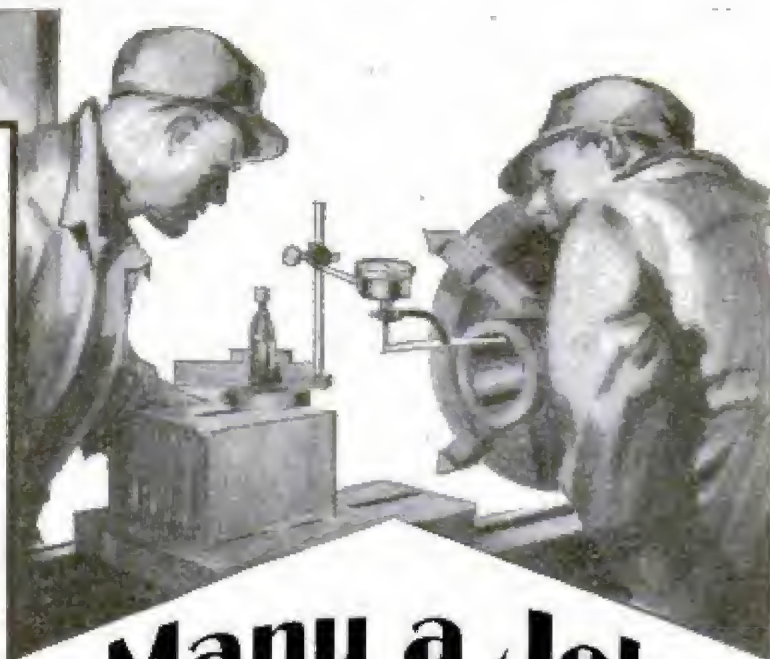


Universal Dial Indicator Set No. 740

This is an accurate indicator of conveniently small size and extreme durability. The design of the set and its attachment enables the user to adjust it to almost any position.

Twist Drill and Machine Screw Tap Gauge No. 707

Tells at a glance the correct drill to use with any common size of machine screw tap. Legible figures tell the size of tap, pitch of thread, size of drill required, etc.



Many a Job Simplified

5 New Tools

Look at the tools shown — all new, all different. Each can do easily jobs which you have probably done with some difficulty in other ways. Ease in doing work is a characteristic quality of Brown & Sharpe tool design.

And these 5 new tools have the same high qualities that have made a Brown & Sharpe the standard of comparison the world over and are well fitted to take their place in the complete Brown & Sharpe line of over 2300 tools.

Examine these new Brown & Sharpe tools at your dealer's and obtain at first hand an idea of their full value and handy design. You'll want some of them in your kit so that you can use them frequently. If your dealer cannot show them to you let us send you a catalog. Department P.M., Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.



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BACK GEARED SCREW CUTTING LATHES

LATHE BUILDERS FOR 23 YEARS — 43,000 LATHES IN USE



9" x 2½' Junior Back Geared Screw Cutting Bench Lathe with Countershaft and Equipment **\$163**

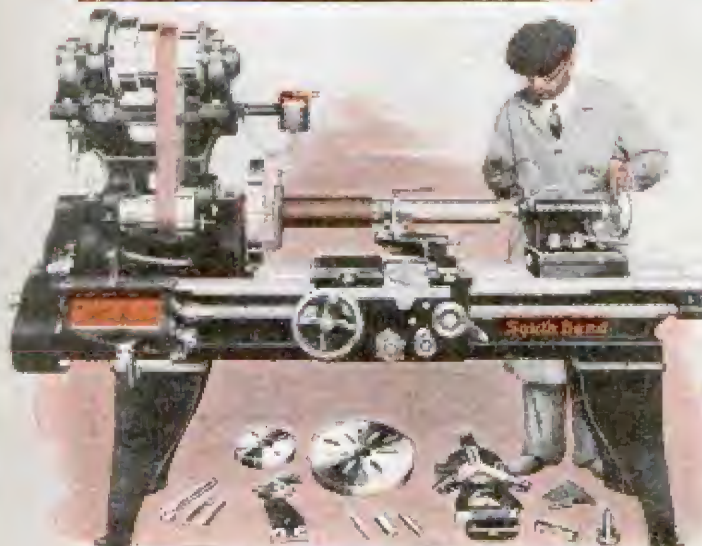


Prices of 9-inch Junior Bench Lathes

Size of Lathe	Shipping Weight	Counter-Shaft Drive	Horizontal Motor Drive
9" x 2½'	350 lbs.	\$163.00	\$244.00
9" x 3'	375 lbs.	169.00	250.00
9" x 3½'	400 lbs.	175.00	256.00
9" x 4'	425 lbs.	182.00	263.00

EASY PAYMENTS as Low as \$13.04 a Month

Our Easy Payment Plan allows you to install a South Bend Lathe in your shop, by making one payment with the order; the balance to be paid month by month, the amount depending upon the size of lathe. Write today for Catalog No. 90-P which describes Easy Payment Plan. Mention size of lathe desired.



18" x 8' Quick Change Gear Silent Chain Motor Driven Lathe.....\$991.00

Prices of Popular Sizes of Quick Change Gear Lathes with Equipment

Size of Lathe	Shipping Weight	Counter-shaft Drive	Silent Chain Motor Drive
9" x 3'	490 lbs.	\$294.00	\$395.00
11" x 4'	725 lbs.	359.00	494.00
13" x 5'	1110 lbs.	443.00	598.00
15" x 6'	1550 lbs.	543.00	716.00
16" x 8'	2035 lbs.	638.00	813.00

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Tool Room
General Repair Shop
Machine Shop
Service Station
Electrical Shop
Engineering Shop and Laboratory

Used by Manufacturers of

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Electrical Parts
Machinery
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Textile Machines
and Government Departments
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16" x 6' New Model South Bend Silent Chain Motor Driven Tool Room Lathe.....\$773.00

96 Sizes and Types

Countershaft Driven Lathes, Motor Driven Lathes, Quick Change Gear Lathes, Standard Change Gear Lathes, Tool Room Lathes, Gap Bed Lathes, Brake Drum Lathes and Bench Lathes.

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Illustrates and describes the New Model South Bend Lathes in various Types and Drives. A copy will be mailed free on request. Write for it.

South Bend LATHES
Catalog No. 90-A

South Bend Lathe Works
606 E. Madison Street, South Bend, Ind., U. S. A.

Gentlemen: I would like your net factory price on a Screw Cutting Lathe, Size _____ for (check kind of work)
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☐ Electrical Work ☐ Catalog No. 90-A

Name _____ Address _____ City _____ State _____

South Bend Lathe Works

606 E. Madison St., South Bend, Ind., U. S. A.
New York, J. E. Beggs Co., 163 Center St. Chicago, C. B. Burns Mach. Co.

"How Rock Thunder died in flames *to save his tribe*"



Told by
Buffalo

Child Long Lance:

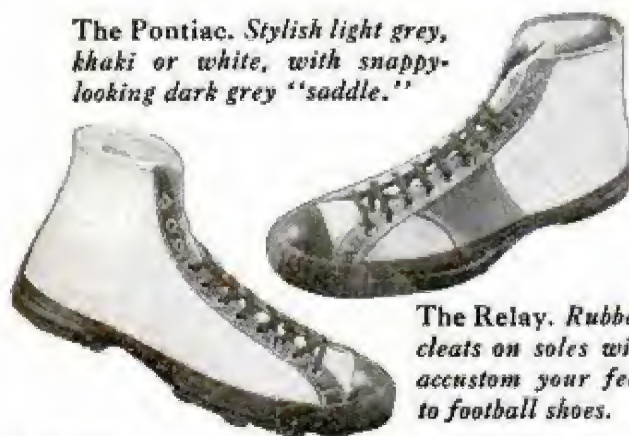
Full-blooded Blackfoot Indian Chief. Trick rider with Buffalo Bill. Tackle, Carlisle football team. Captain, World War (wounded, decorated for bravery). Author of "Long Lance."



"AS I have often said, we Indians were utterly dependent on our feet for our very lives. In all my boyhood experience no incident illustrates this so well as the death of Rock Thunder—one of our greatest Blackfoot warriors.

"He was wounded in a battle with the Crees. It was only a severed sinew in his foot, but it might as well have been more serious because he slowed down the speed of our whole party—and our food was running low. If we did not get out of the mountains the Crees might attack again.

The Pontiac. Stylish light grey, khaki or white, with snappy-looking dark grey "saddle."



The Relay. Rubber cleats on soles will accustom your feet to football shoes.

chanting his death song—and the only movement he made was to run the back of his hand once over his forehead—to keep the sweat from running into his eyes.

"The Americans of today live far different lives than we did—the earlier Americans. Yet I believe that sturdiness of foot and leg, developed in childhood, is as important to your general health as it was to our very lives.

"This object I believe is best attained by the wearing of canvas rubber-soled shoes—when-
ever and wherever possible."

By Long Lance

DEMAND Goodrich Sport Shoes by name. Otherwise how can you be sure of getting the best that Indian lore and modern science offer you? You'll be amazed how much style can be built into such sturdy canvas rubber-soled shoes!

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio. Pacific Goodrich Rubber Company, Los Angeles, Calif. In Canada: Canadian Goodrich Co., Kitchener, Ont.

Goodrich Sport Shoes



Why it is *easy* to learn to type on CORONA

"OUR little boy has loved Corona ever since he was big enough to notice the letters."

"I learned to use Corona when I was sixty-eight. It is much easier than writing by hand."

Scores of letters like the above have come to us. They show how easy it is to use Corona. If children too young to hold a pencil can use Corona, anybody can. If old people whose handwriting has grown shaky can use Corona, anybody can.

In the very beginning, Corona was designed with the idea that it would be used by people who had no typewriter experience.

That was twenty years ago. Corona is still built with the beginner in mind. All the needs of the amateur typist have been studied by Corona engineers. Every year we have improved Corona—made it more convenient. Here are a few advantages which make it the easiest typewriter in the world to operate:

Adjustable Key Action—The touch can be made light or heavy to suit your requirements.

Adjustable Paper Guide—Insures

uniform margin on all pages of a manuscript.

Back Spacer and Margin Release—These are conveniently located on the keyboard.

Carriage Return Lever—This is made extra large and convenient. It enables you to perform the two operations of spacing and returning the carriage to the starting point with one sweep of your hand.

Extreme Visibility—Holds paper at correct reading angle.

Key Spacing—Same as on office typewriters.

Standard Keyboard—Four rows of keys, exactly like a big office machine.

In making Corona easy for beginners to operate we accomplished another result—an unforeseen result. The very features which enable beginners to write more easily, enable accomplished typists to greatly increase their speed.

You owe it to yourself to drop into a store where typewriters are sold and see Corona. The minute you lay eyes on it you will

realize why a million people use it—why Roosevelt took one to Africa—why 30,000 Coronas were used in the World War—why more novelists, more newspaper men, more business men, more schools and colleges use Corona than all other portables put together.

For a small down payment you can take a beautiful new Corona home with you today. Don't neglect this opportunity. Don't let another day pass without doing something about it. Know now the joy of owning a sturdy, speedy, smooth-operating Corona—the World's Champion Portable.

An interesting illustrated booklet called "Corona Typewriters," which describes Corona in detail, and contains beautiful illustrations of the new color models, will be sent you upon request. No obligation. Simply mail the coupon below.

L C SMITH & CORONA TYPEWRITERS Inc
51 Madison Ave., New York, N.Y.

Please send me the free booklet,
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Air-cooled comfort for whirlwind feet!

Camp life doesn't wait on hot days. From early in the morning till late at night, those high-powered feet of yours are *in motion—and how!* Give your feet a chance to get their breath! Wear cool *Keds* in games and on the trail.

Keds are light, springy, tough shoes, made especially for sports and play wear. They are much more than ordinary "sneakers." For example—Keds are made with specially designed safety-soles which grip the smoothest surfaces, and absorb the roughest shocks.

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For years, Keds have been endorsed by leading physicians and coaches.

Keds offer the most complete assortment of styles and models for all indoor and outdoor sports activities. Keds are made by the world's largest specialists in canvas rubber-

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Keds—Keds—Keds—Look for that name stamped on all genuine Keds.

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This handsome shoe puts lightning in your feet and protects you against slipping! Note the special safety-sole. Keeps your feet cool and gives them protection whether you're playing baseball or taking the jolts of the trail.



MEN!

Place this Master Key Case Display on 20 Store Counters and Collect \$20.00 a Day Profits



\$20.00 EVERY DAY—\$140.00 a week CLEAR PROFIT—that's what you or any other live wire can earn by simply placing these astonishing new "Automatic Salesmen" of newly patented MASTER KEY CASES on store counters. Here is a new way of raking in profits from AUTOMATIC SALES AT WHOLE-SALE, using our successful, tested selling plans. Profits 100% SELLING THROUGH dealers—over 200% selling direct to consumer in full or spare time. This amazingly clever Key Case—retails for only 25c, although it is better made and better designed than ordinary cases selling at a dollar, at five dollars, or even more. Notice that the Genuine Leather is beautifully colored—comes in Cowhide finish, Scotch Grains, Black and Brown, Pebble Stone and other attractive colors; then you will know why several are bought at a time in different colors for separate sets of keys. It has no sharp edges or points to catch or tear the pockets. It cannot rattle or scratch when on the dashboard of an automobile. Holds six keys, always in the same position. Works like a jackknife. Opens and shuts in an instant, with snap fasteners. See all these selling features for yourself—and then you'll KNOW why it is a cinch to earn \$20.00 a day—and more.

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When this key case was first put on the market, its instant popularity soon showed that the market for it was big in the United States. You can place the Master Key Case Display with automobile and auto accessory dealers, drug stores, hardware stores, grocers, novelty shops, cigar stores, men's furnishings stores—hundreds of different places where the dealer is glad to accept your unusual offer.

13 Master Key Cases to Each Display Card

A Lifetime Opportunity with This Automatic Profit Maker

Just walk into a store and say, "Mr. Smith, let me put this beautiful Automatic Salesman of genuine leather key cases on your counter. Doesn't cost you a cent. I'll be round in a few days to collect for the Key Cases that your customers buy."

Not a cent of investment for you, no trouble, and you receive a mighty sweet profit into the bargain. Can that dealer refuse? You bet he won't—he'll grab at the chance—he won't let you get out of the store without leaving at least one Automatic Salesman. And when you come around again, it's a hundred-to-one shot that every Key Case is sold. WE PACKED 13 KEY CASES ON A CARD, INSTEAD OF JUST A DOZEN. The 13 cases, at 25c each, bring the dealer \$3.25, leaving him a clear profit of \$1.75 on every card—and making YOU a clear profit of one dollar. You can EASILY place 20 cards with dealers every day—60 cards every 3 days. Your cost in lots of 60 is only \$1 per card. Selling to dealers at \$2.00 per card, you make 100% profit or

\$20 a day. And you don't even have to do all the placing yourself. You can easily employ other salesmen to place some of the cards for you, bringing your profits way up. And another thing—we haven't said a word about the repeat business.

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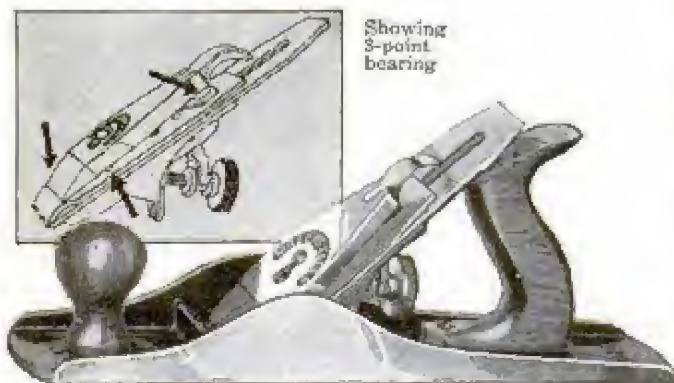
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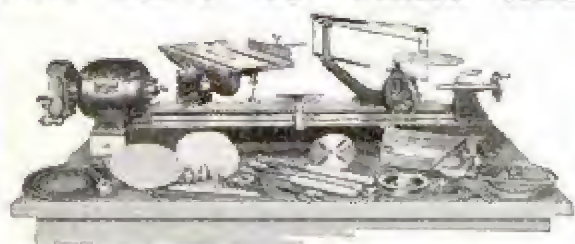


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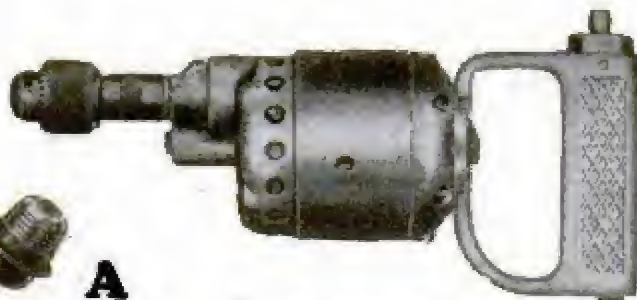
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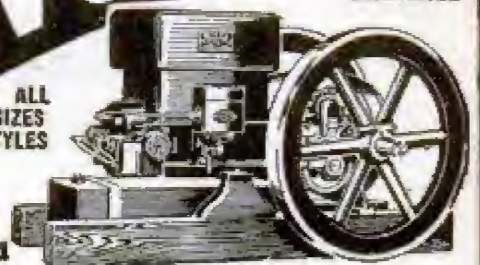
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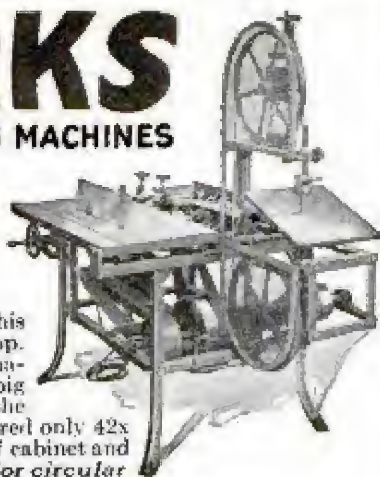
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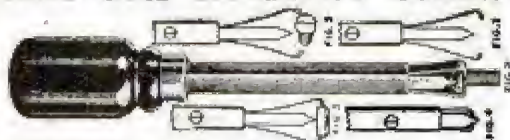
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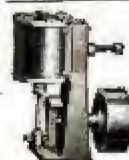
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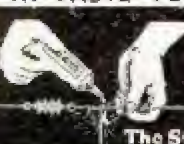
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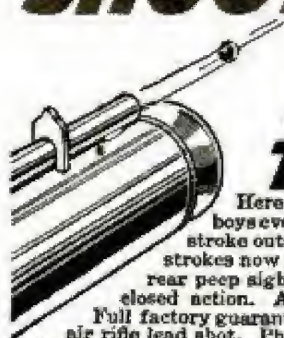
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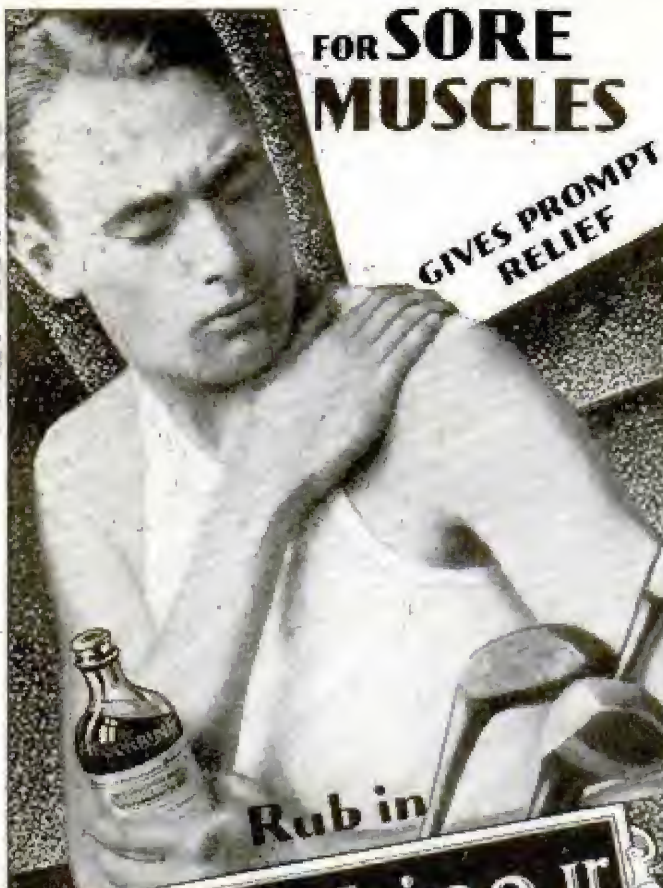
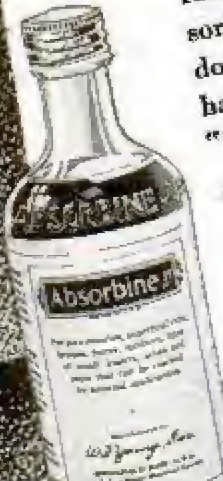
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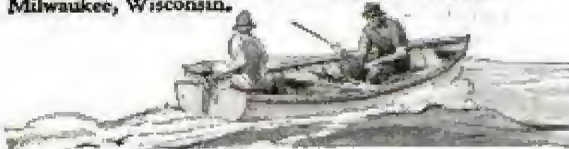


Snap! When the Elto Lightweight is through for the day, you snap it "closed" — simple as shutting a pocket knife! Then it measures only 22" by 11" by 11" — easy to carry and stows anywhere.

The Super Elto Lightweight

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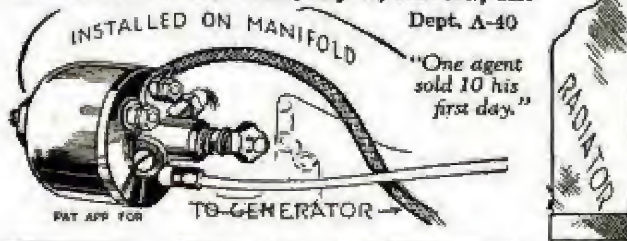
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Dept. A-40



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So easy to compare with
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Instantly your beard gets moist . . . easier to cut and pliable . . . scientifically softened right down at the base . . . then your razor can do its best work.

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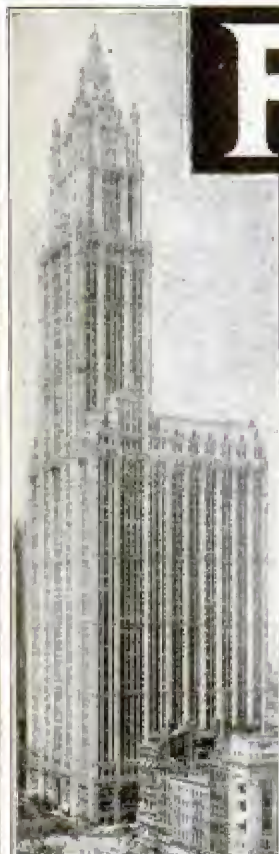
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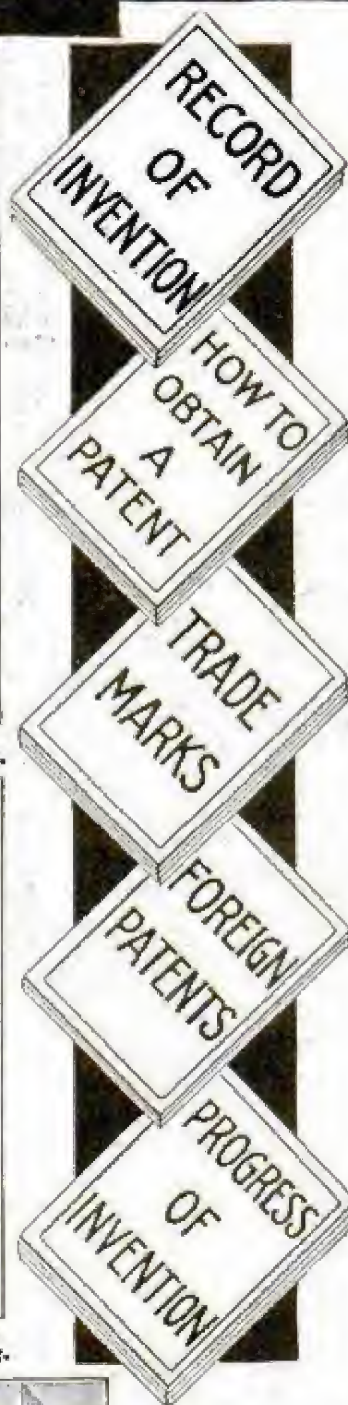
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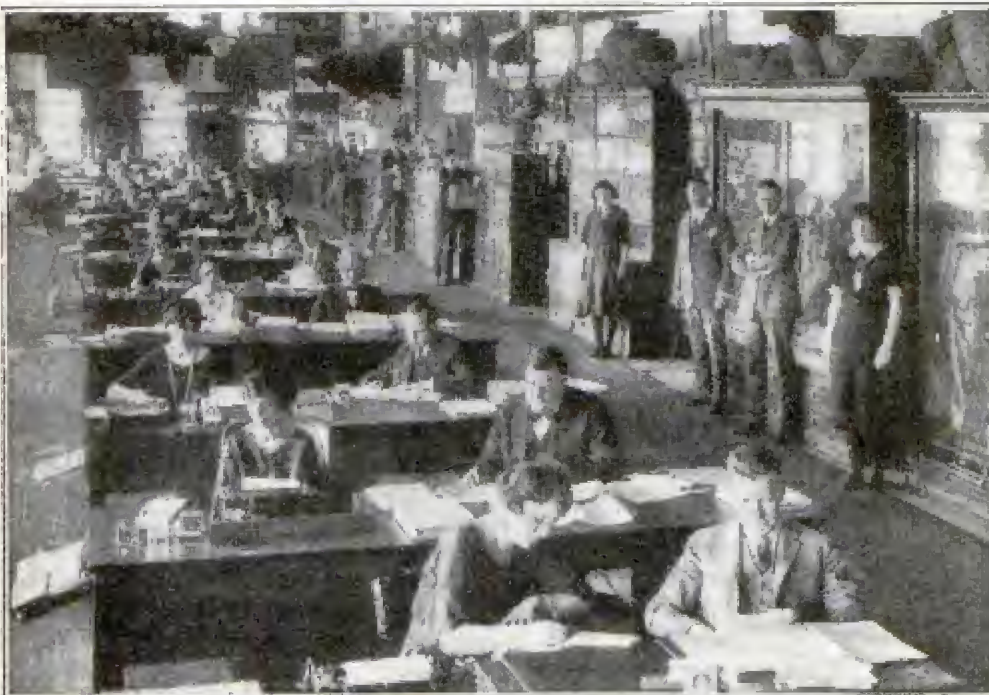
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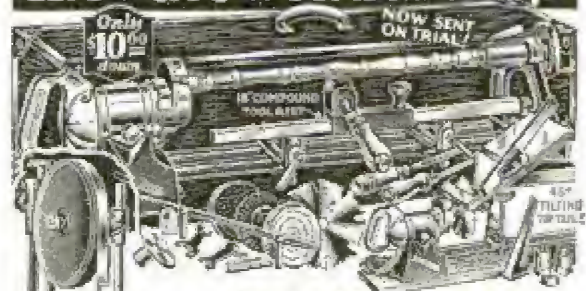
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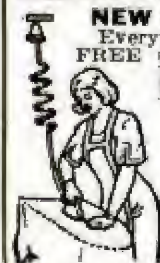
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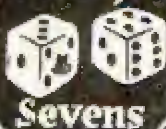
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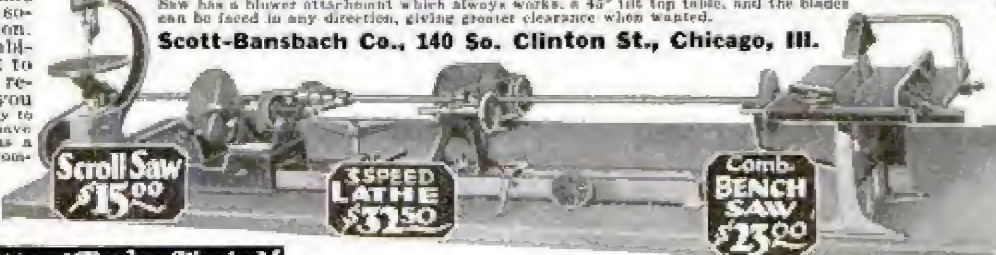
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The **Wonder Combination Bench Saw** (18 Tools in One), the **Wonder Three-Speed Lathe** with three step pulleys and countershaft combined, making lining up of pulleys unnecessary, and the **Wonder Scroll Saw**, a practically vibrationless machine, with which you can do delicate scroll work on either light or heavy material. The **Scroll Saw** has a blower attachment which always works, a 45° tilt top table, and the blades can be faced in any direction, giving greater clearance when wanted.

Scott-Bansbach Co., 140 So. Clinton St., Chicago, Ill.



3 Machines
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\$77.00
Without Motor

A combination of machines on which you and a couple of helpers can work and turn out anything desired in the wood-working line. Write for details about this **WONDER** outfit. Sold on 15 days approval, money back guarantee.

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Foley Electrakeen Lawn Mower Sharpener

Don't let this WONDERFUL OPPORTUNITY go by! Don't hesitate for lack of money—VERY LITTLE CAPITAL NEEDED. Get started at once, early in the season and make BIG MONEY this summer.

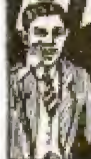
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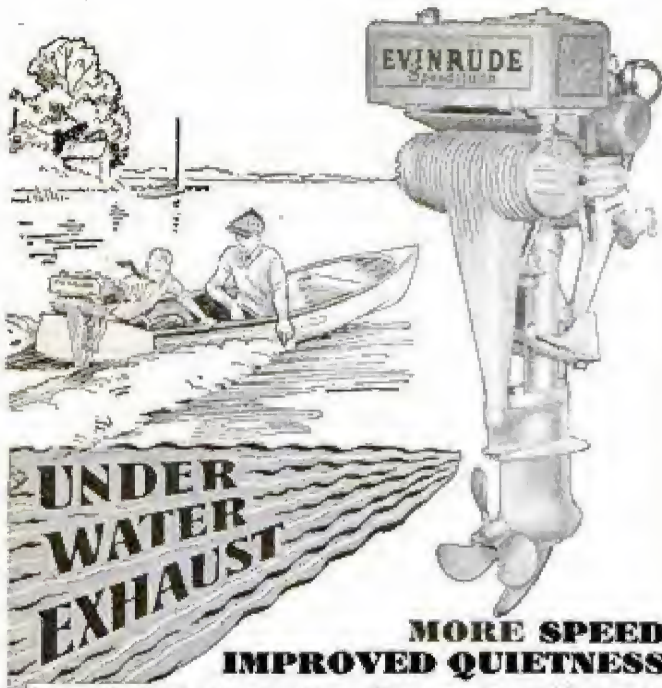
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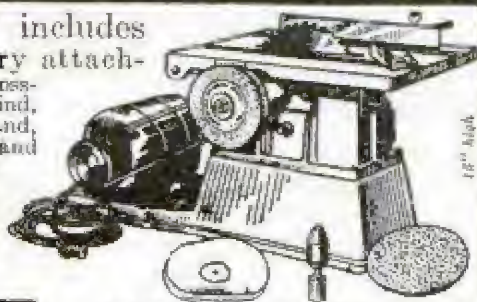
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F.O.B. Phila.

OUTFIT includes necessary attachments to rip, cross-cut, bevel, grind, mitre, groove, sand, mortise, tenon, and polish. Table tilts to 45° angle. Base for saw and motor makes it portable.



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INSTANT Kerosene Flame No Pre-heating

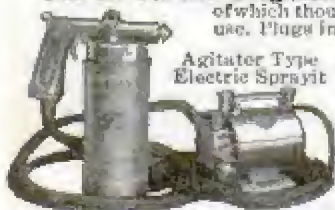
NO pumping! No priming! No pre-heating! Turn the valve, strike a match! Instant kerosene flame! The hottest blue flame you ever worked with is on the job.

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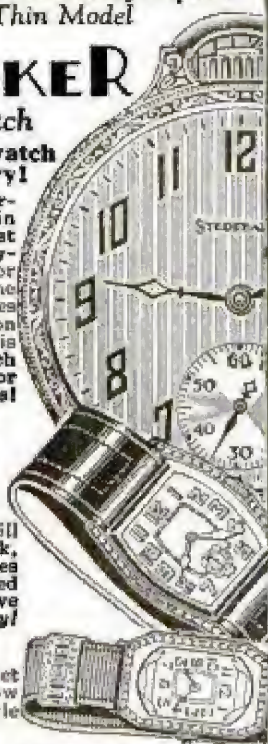
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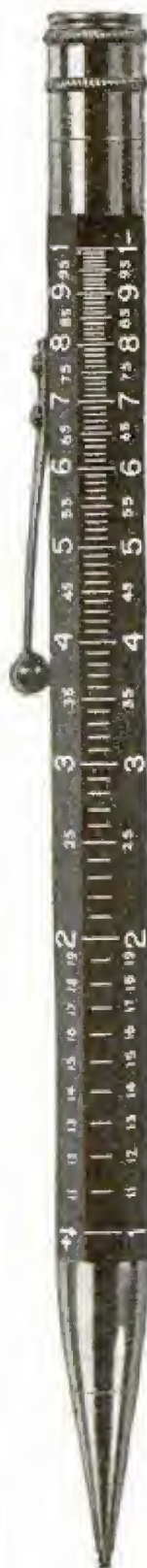
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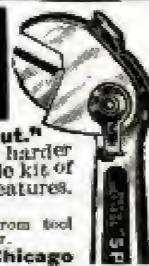
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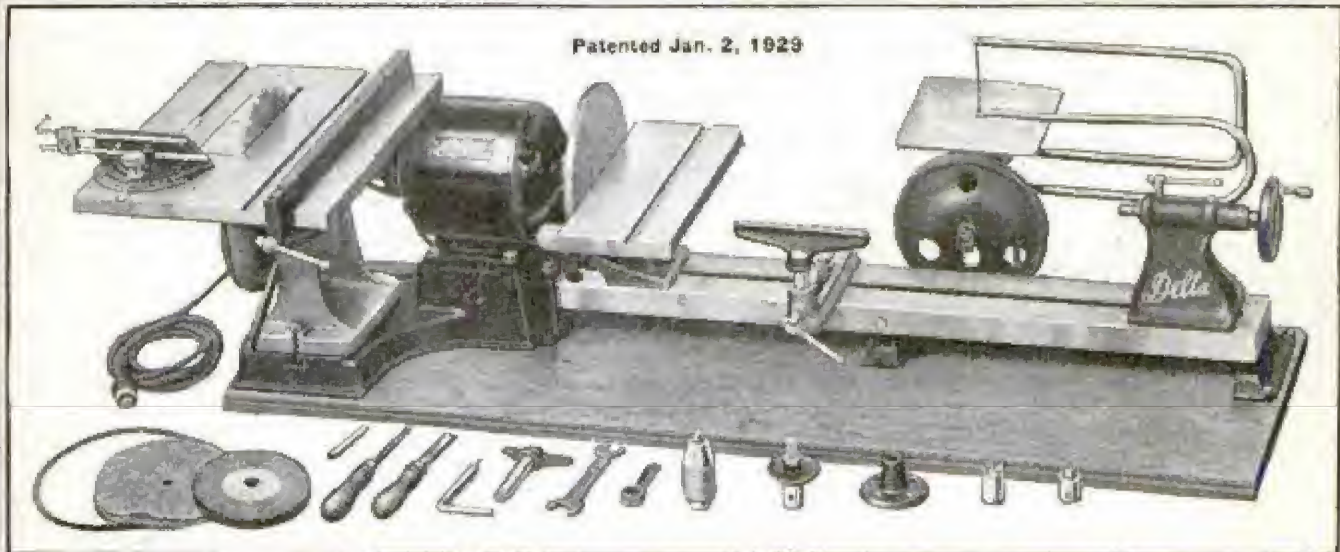
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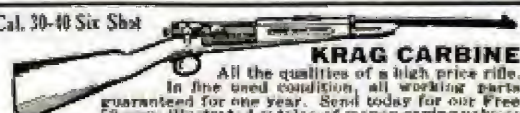
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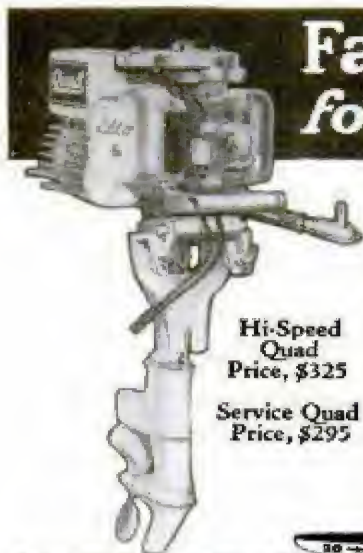


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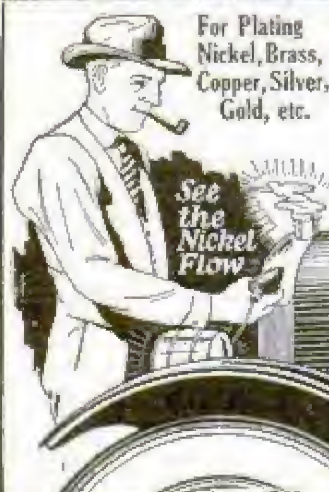
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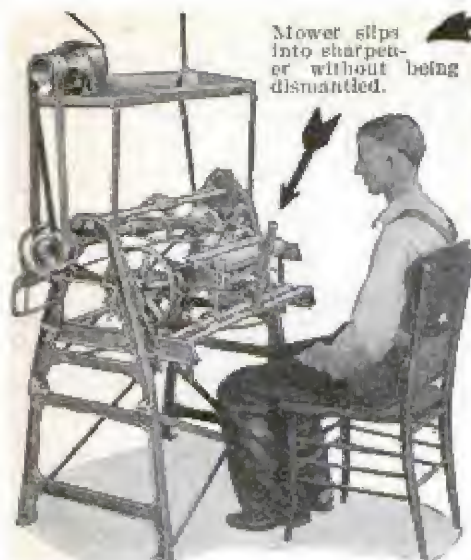
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Man, Why Don't You Do That? You've got the chance—the same chance as W. T. Moore, Twin Falls, Idaho, who made \$1200 net profits in 90 days—the same chance as Walter Weaver, Middletown, N.Y., who made \$1000 in 4 months—the same chance as hundreds of others who have reaped rich rewards with this amazingly efficient lawnmower sharpener.

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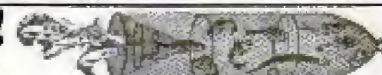
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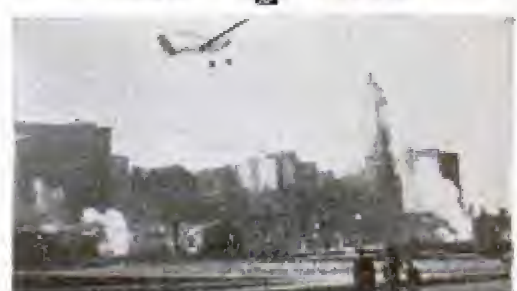
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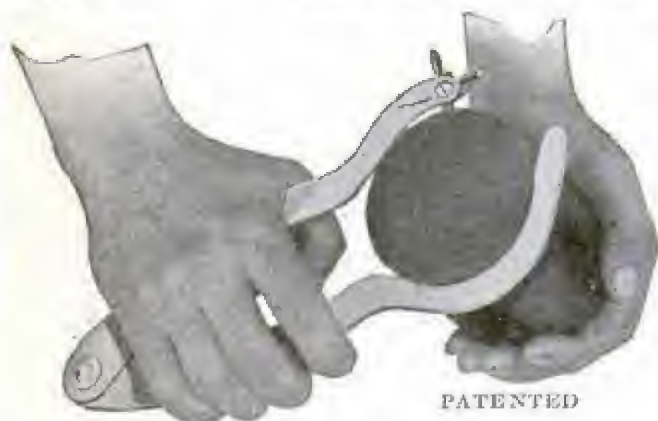
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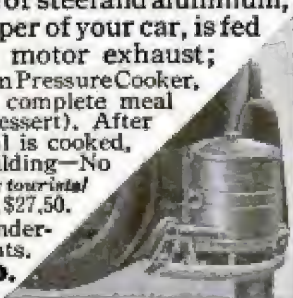
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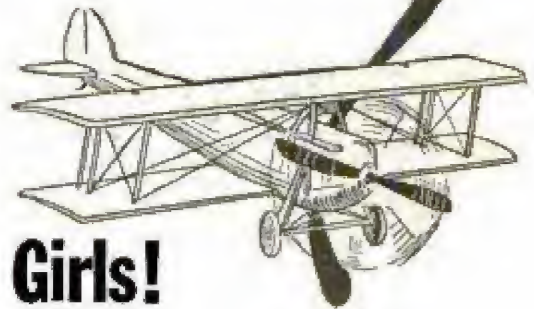
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Therefore, act this minute! Don't delay a second. I am going to give a big special prize of \$500.00 for promptness, so hurry now. Rush! There's a fortune at stake. No matter what your age or occupation, you positively can win one of these big prizes if you act! The most startling advertising plan ever heard of. Just imagine being enabled to win \$500.00 in cash by acting quick right now. Learn about this sensational new prize plan. It's positively free. Everyone taking an active interest LIBERALLY rewarded. Send your name and address on the coupon right this minute so that it will reach the Judges in a hurry. There are no puzzles to solve or things like that—but act now!

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54 West Illinois St., Chicago, Illinois.

Dear Sir: I have read your advertisement, and am submitting my name as a candidate for the First Grand Prize, a new Waco Airplane and complete flying instruction, or \$3,745.00 in cash, AND ALSO PROMPTNESS PRIZE OF \$500.00. It is understood there is no cost or obligation to me, and it is not necessary to buy anything now, later, or ever.

Name

Address

Town, State



FUGO

FIRE EXTINGUISHER

Unusual opening for live agents in every locality. Make \$5000 or more a year—easily. Fugo—the instantaneous automatic fire extinguisher—is needed and wanted in every home, store, theatre, garage, shop, school, automobile, etc. Cheapest fire protection available today. Within reach of all.

1 Qt. Size \$5.00 2 Qt. Size \$7.50

Recharged in a jiffy

Amazing 30-second demonstration clinches sale—each one sold sells others. Territory going fast. Write at once for wonderful proposition that will make you big money.

THE NATIONAL FORMETAL CO.
6535 Metta Ave., N. E. Cleveland, Ohio



Auto Seat Covers

\$2.95

Special Price Offer

Agents Make \$20 a Day

Write orders fast for this excellent Quality line Auto Seat Covers. Amazing value—quick sale. Cash daily. We deliver. Write for handsome, Free Leatherette Sample Outfit.

Quality Sales, 515 S. Dearborn St., Dept. 616, Chicago



PAINT WITH AIR

New Simplified Easy Way!

with improved Payntgun! Quickest, easiest way to paint ever discovered. Anyone can put perfect smooth brilliant surface on car, furniture, woodwork, etc., with lacquer, varnish, paint or enamel. No experience needed—years of painting skill built into the Payntgun. New exclusive features cut painting time in half. Sturdily built—compact—convenient. Powerful spray specially designed for easy sure control. Turns painting jobs into play. Fully guaranteed.

FREE Folder on Skillful Home Painting—Write for yours today!

HAYWOOD EQUIPMENT COMPANY
2345-H Ogden Avenue, CHICAGO, ILL.



AGENTS WANTED

NEW MODEL WALTHAM & ELGIN SENT FOR \$1.00



12 MONTHS TO PAY

Send \$1.00 with order and tell us a little about yourself. (A) How long at present address. (B) Age. (C) Married or Single. (D) Name of employer. (E) Position. (F) How long at that work. All information held strictly confidential. — We make no direct inquiries of anyone—not even from your employer.

10 Days' Free Trial Satisfaction Guaranteed

Watch comes to you postage paid—no C. O. D. to pay on arrival. You take no risk—satisfaction guaranteed or money back.

Established 1895

ROYAL DIAMOND & WATCH CO.

ADDRESS DEPT. 11-T 170 BROADWAY, N.Y.

Catalog FREE To Adults

New catalog of genuine diamonds, standard nationally advertised watches, fine jewelry. Write for it now.

\$2950

DC 15—A New Sport model. White or Green Gold filled case warranted 20 yrs.; guaranteed accurate. Elgin or Waltham movement. Gold filled "Wrist-dret", flat wrist band.

Play Your Way to BIGGER PAY!



and Popularity —with a Buescher

The Saxophone has brought big money to many stars. As Orchestra features—as Orchestra leaders—as stage soloists—as recording artists and in other ways—hundreds of musicians have played their way to big pay and stardom on the

BUESCHER

True-Tone Saxophones

Only a Buescher Gives You All These:

- Patented Snap-on Pads—greatest improvement for beauty of tone; easy to replace—no more cementing.
- Patented Automatic Octave Key—always positive.
- Hands never moved from one playing position.
- 6 Days' Trial in Your Home on any Buescher Saxophone, Cornet, Trumpet, Trombone or other instrument. Try the fingering arrangement—play it—hear its true, rich, clear tones, without obligation to buy.

Easy to Play—Easy to Pay

Besides being easy to play we make it easy to pay. A small down payment and a little each month. Write today for full information on our liberal offer. Give name of instrument in which you are interested.

BUESCHER BAND INSTRUMENT CO.
2794 Buescher Block Elkhart, Ind.

HARDWOOD LUMBER

PANELS, VENEERS and INLAY WOODS CUT TO SIZE

CRAFTSMAN WOOD SERVICE

715 E. 62nd Street CHICAGO, ILL.

METAL TURNING LATHE \$35.00



Also 7 in. swing 3 speed cone pulley

Speed Lathes \$8.75

Goodwin Mfg. Co. 435 Keola St., OTTUMWA, IOWA

New! SCREW-HOLDING SCREW DRIVER!

.. absolute necessity for those tough jobs!



Amazing new patented invention! Removes and inserts screws instantly with one hand from inaccessible places. Then does work of ordinary screw driver. Grips any screw tightly by its slot. (Non-magnetic.)

Garages, factories, machinists, electricians, radio, auto owners buy on sight!

2 sizes—9" length, $\frac{1}{8}$ " blade for large screws. \$1.50 only.
8" length, $\frac{3}{16}$ " blade for small screws. \$1.25 only.

Worth three times its price as labor and temper saver the first day used.

Either or both sizes sent post-paid receipt check or money order.

DISTRIBUTORS. genuine opportunity earn big money! Exclusive territory! Write or wire quick for full details.

150

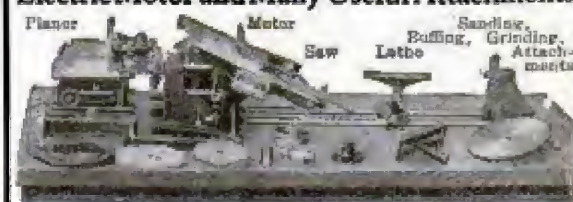
JEFFY-TITE MFG. CO.
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Jiffy Jr.

SOLD ON EASY TERMS

WORKACE Electric WOODWORKER

Complete Outfit Including Planer, Saw, Lathe, Electric Motor and Many Useful Attachments



Planer Motor Saw Lathe Sanding, Buffing, Grinding, Attachments

Fast—Accurate—Complete

Price complete, \$89.00. Easy Terms. Write for complete information.

J. D. Wallace & Co., 2845 Adams St., Chicago
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Establish a Good Future



DON'T BE A SHOP WORKER

START a business of your own NOW—no experience necessary. The only key machine that cuts ALL kinds of keys. No hand-filing. Make first keys by number without taking locks apart. Instructions furnished free.

WRITE TODAY.

BEISSER KEY MACHINE COMPANY
407 Fort St. East Detroit, Mich., U. S. A.



Give'er the Gun -and ZOOM Away!

SWOOPING like an airplane, soaring over hills, skimming along beckoning roadways—motorcycling truly is the "Sport of a Thousand Thrills".

Astride a Harley-Davidson, any road is your road—for hours or days of joyous travel, at a cost too low to bother about. Glorious vacation trips. Week-end jaunts to lakes and streams. Tours to distant cities or frontier wilderness. Just jump into the saddle and GO!

See the 1929 Harley-Davidsons at your local dealer's today. Ask about his Pay-As-You-Ride Plan.

Mail the Coupon for literature showing our full line of Twins and Singles.

HARLEY-DAVIDSON

Motorcycles

Model shown above is our Big Twin, famous the world over — favorite of riders everywhere. We also build a wonderful "45" Twin that costs only \$290 f. o. b. factory. And Singles at \$235 and \$255.

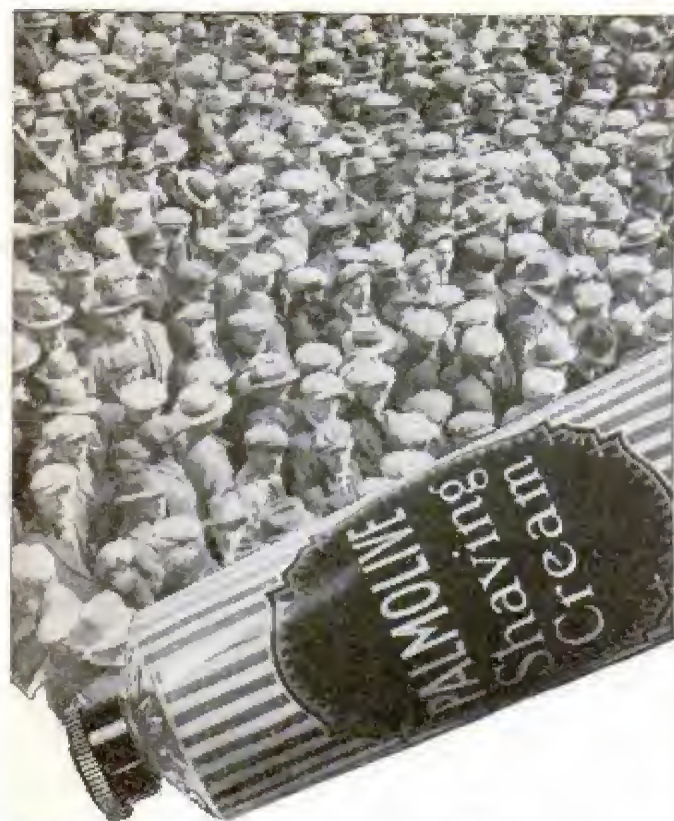
HARLEY-DAVIDSON MOTOR CO., Dept. P., Milwaukee, Wis.
Interested in your motorcycles. Send literature.

Name.....

Address.....

My age is ☐ 12-15 years ☐ 16-19 years ☐ 20-30 years
☐ 31 years and up. Check Your Age Group.

Mail this
Coupon!



We have Sent
3,000,000 men this free 7-day tube
86% of those who try it discard their
old-style methods. Will you send the
coupon for your test? It's free.

GENTLEMEN: Some time ago we asked 1,000 men to advise us in creating a new shaving preparation—Palmolive Shaving Cream. They told us 5 important ways old methods failed to please. After much experimenting we've finally succeeded—and millions of men have acclaimed the cream we make.

- 1: Multiplies itself in lather 250 times.
- 2: Softens the beard in one minute.
- 3: Maintains its creamy fullness for 10 minutes on the face.
- 4: Strong bubbles hold the hairs erect for cutting.
- 5: Fine after-effects due to palm and olive oil content.

Our free test offer

Probably you will find we have anticipated your desires in our unique new cream. So we ask you, in fairness to yourself—and to us who have tried to please you—to mail the coupon now. A generous 7-day test will come to you by return mail. Act now.

To add the final touch to shaving luxury, we have created Palmolive After Shaving Talc—especially for men. Try the sample we are sending free with the tube of Shaving Cream.


PALMOLIVE RADIO HOUR—Broadcast every Wednesday night—from 9:30 to 10:30 p. m., eastern time; 8:30 to 9:30 p. m., central time; 7:30 to 8:30 p. m., mountain time; 6:30 to 7:30 p. m., Pacific Coast time—over station WEAJ and 37 stations associated with The National Broadcasting Company.

7 SHAVES FREE

and a can of Palmolive
 After Shaving Talc

Simply insert your name and address and mail to Palmolive, Dept. B-3070, 595 Fifth Avenue, New York City.
 In Canada, address Palmolive, Toronto 8, Ont.

(Please print your name and address)



This HB Constant Potential Battery Charges up in less than another Make

You Too Can Add Profits of \$150 to \$300 Monthly

Mechanics, Repair Men, Garages and Battery Shops are adding customers and profits without expense to them. Start in business yourself with HB One Day Battery Service. You'll get the business by charging batteries in one-third the time required by other methods. HB does better charging—at lower cost to you. Comes to you for

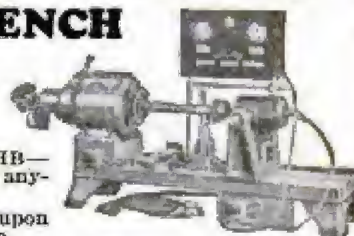
ONLY \$16 MONTHLY

Check No. 1 in the coupon below for full information.

HB TEST BENCH

Another Big Profit branch of automotive service is Starting-Lighting-Ignition Service. You can do it with practically no investment. ONLY \$20 MONTHLY for this HB—priced \$100 to \$150 below anything near its quality.

Check No. 2 in the coupon below for full information.



BRING CUSTOMERS TO YOUR DOOR



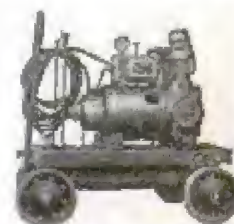
Better Air Service than the other fellow's is yours for only \$12 monthly. Dependable Day and Night Service keeps car owners coming to your door day after day. Only HB quantity production makes possible the low price on this Silent, Beltless, Upright, Ball Bearing, Twin Cylinder HB Automatic Air Service.

Check No. 4 in the coupon below for full information.

HB PORTABLE PAINT SPRAY

Enables you to underbid every competitor, yet makes more profit for yourself on every job. Does the work of five brush painters and does it better. Paint automobile, houses, barns, garages, furniture.

Check No. 3 in coupon below for full information.



HOBART  BROTHERS
Successful manufacturers ~ since 1893 ~

BOX M69

TROY, OHIO

Tear off Coupon and Mail Today

HOBART BROTHERS CO.
 Box M69, TROY, OHIO.

Send me complete information on the items I've checked with your 30 day trial offer, easy payment terms, and information on how HB equipment will increase my earnings.

- 1 ☐ One Day Battery Service Profits
- 2 ☐ Electrical Test Bench Opportunities
- 3 ☐ Portable Paint Spray Business
- 4 ☐ Better Automatic Air Compressor

NAME.....

ADDRESS.....

Special! My 1929 Offer to You

I Will Save You Money

Read my 1929 Offer to You



FREE

Your choice a gold watch chain or beautiful strand of pearls with every watch sold. Offer good for limited time only.



In addition to our New Low Price, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. They are found in the pockets of men in the service on every railroad in this country. Senators, Congressmen and Governors keep their official appointments by "Santa Fe Special" time. Army Officers and Privates carried them all through the Greatest War in history—thousands of these splendid watches are in use all over the World. If you want one on my liberal new LOW PRICE PLAN, you had better write for my Free Watch Book today and make your selection without delay. I will send the Watch for you to see WITHOUT ONE PENNY DOWN—I will even allow you to wear the Watch 30 days FREE—then sell it to you on a binding money-back guarantee.

Save 1/3 to 1/2 of Your Money Most Liberal Offer Ever Made

Our "Direct-to-you" low wholesale terms and EXTRA SPECIAL DISTRIBUTION PLAN is fully explained in the New Santa Fe Special booklet just off the press. The "Santa Fe Special Plan" means a BIG SAVING of money and you get the BEST watch value on the market today. I want you to see all the newest designs in the new thin model Santa Fe Special in both white and green gold—the handsome sturdy case models

designed for our famous Santa Fe Mogul Watch—the very newest creations in Men's Strap Watches, sturdy in design and beautifully engraved in both white and green gold and the artistic Ladies' Bracelet Watch, in many shapes and designs in white gold, some with diamond and sapphire settings. No matter what your choice of a watch may be, there is a Santa Fe Watch for you.

Write for FREE Watch Book Today

shows newest watch case designs in 4 colors. READ the so-called SECRETS of watch making. READ how you can save from ONE THIRD to ONE HALF of your money—Buy "Direct." The wise man will act quickly if he wants a watch.

EASY PAYMENTS TO SUIT YOU—Don't delay—Fill out and mail the coupon below for the FREE Watch Book.

SANTA FE WATCH COMPANY
66 THOMAS BUILDING TOPEKA, KANSAS

SANTA FE WATCH COMPANY,
66 Thomas Building, Topeka, Kansas.

Please send me the New Watch Book with the understanding that this request does not obligate me in any way.

Name.....

Address.....

City.....State.....



"How we saved our first \$500"

"MARY and I had been married four years, but we couldn't save a cent. Fact is, we were constantly in debt and I was always worried for fear I would lose my position.

"Then one night I saw that something must be done, so I told Mary I was going to take a course with the International Correspondence Schools. 'I've been hoping you would do that,' she said. 'I know you can earn more money if you really try.'

"So I started studying after supper at night, in the spare time that used to go to waste. It wasn't hard and pretty soon I began to see it was helping me in my work. In three months a new position was open and the Boss gave me a chance at it because he'd heard I was studying with the I. C. S.

"Well, that was the start. Before the end of the year I received another raise and we began to save. We've got \$500 in the bank now and we're going to have a lot more soon."

For thirty-five years the International Correspondence Schools have been helping men to win promotion, to earn more money, to get ahead in business and in life. You can do it too.

At least, find out how by marking and mailing the coupon printed below. It doesn't cost you a penny or obligate you in any way to do this, but it may be the means of changing your entire life. Do it now.

Mail This Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 5620-F, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course before which I have marked X in the list below:

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|--|---|
| <input type="checkbox"/> Architect | <input type="checkbox"/> Automobile Mechanic |
| <input type="checkbox"/> Architectural Draftsman | <input type="checkbox"/> Aviation Engines |
| <input type="checkbox"/> Building Foreman | <input type="checkbox"/> Plumber and Steam Fitter |
| <input type="checkbox"/> Concrete Builder | <input type="checkbox"/> Plumbing Inspector |
| <input type="checkbox"/> Contractor and Builder | <input type="checkbox"/> Foreman Plumber |
| <input type="checkbox"/> Structural Draftsman | <input type="checkbox"/> Heating and Ventilation |
| <input type="checkbox"/> Structural Engineer | <input type="checkbox"/> Sheet-Metal Worker |
| <input type="checkbox"/> Electrical Engineer | <input type="checkbox"/> Steam Engineer |
| <input type="checkbox"/> Electrical Contractor | <input type="checkbox"/> Marine Engineer |
| <input type="checkbox"/> Electric Wiring | <input type="checkbox"/> Refrigeration Engineer |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> R. R. Positions |
| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Highway Engineer |
| <input type="checkbox"/> Telegraph Engineer | <input type="checkbox"/> Chemistry |
| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Coal Mining Engineer |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Navigation <input type="checkbox"/> Assayer |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Iron and Steel Worker |
| <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Textile Overseer or Supt. |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Woolen Manufacturing |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Poultry Farming |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Mathematics <input type="checkbox"/> Radio |

BUSINESS TRAINING COURSES

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Business Correspondence |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Show Card and Sign Lettering |
| <input type="checkbox"/> Personnel Management | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> English |
| <input type="checkbox"/> Accounting and | <input type="checkbox"/> Civil Service |
| C. P. A. Coaching | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Cost Accounting | <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Grade School Subjects |
| <input type="checkbox"/> Secretarial Work | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Spanish <input type="checkbox"/> French | <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Illustrating |
| <input type="checkbox"/> Advertising | <input type="checkbox"/> Lumber Dealer |

Name.....

Address.....

City..... State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



Taylor Compasses

A walk through the woods or following a trail may lead one miles away from camp, but there is no danger of getting lost if you carry a Taylor Compass. You are sure to find your way back to camp or out of the woods.

Taylor Compasses have been the favorites of sportsmen for many years. They will be found at leading hardware and sporting goods stores everywhere.

There's a Taylor Compass for every price and requirement

Leedawf Compass.....	\$1.50
Magnapole Compass.....	1.75
Flodial Compass.....	1.75
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Gydawf Compass.....	3.50
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Your dealer can supply you, or write direct to us, enclosing price, plus 10c postage, and we will send any of the above, safe delivery guaranteed. Taylor Compass Booklet sent free upon request.

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ROCHESTER, N.Y., U. S. A.

Canadian Plant
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CRESCENT
\$58.50

WOOD LATHE with 1/4 H. P. Motor
Built in Head

For Cabinet Makers, Schools and Amateur Mechanics; a correctly designed, exceptionally well built, substantial lathe, 24" between centers; 9" swing over bed (8" over tool rest). Motor head stock has speed of 1750 R. P. M. Motor is controlled and protected by combination switch and circuit breaker. The Crescent line comprises many kinds of wood working machines, portable and for mills, quality made, moderately priced.

THE CRESCENT MACHINE CO.
93 Columbia St., Leontia, Ohio

Send for FREE BULLETINS

INSTALL YOUR OWN PLUMBING AND HEATING

Write for our big free book containing 4,000 wholesale bargains showing exactly how you can save all labor costs and one-half on material. No experience necessary. Our amazing plan explains everything.

Address—Burke (4) Brothers, 418 Liberty Avenue, Pittsburgh, Pa.

Mac WORKSHOP
Electrically Operated

THE POPULAR MECHANIC



This Complete Mac Workshop Now Sent on 10-Days Free Trial

Send now for details about this big, powerful, sturdy equipment. 36" lathe, 8" saw, 4" Jointer, 1-3 Horse Power Motor, Jig Saw, and all units for a complete motorized workshop. Easy to operate. Shipped on approval, ready to plug into light socket. Plans and instructions furnished. Unusually low prices and convenient monthly terms. GET DETAILS QUICK!

Midland Appliance Corporation

Dept. 610 225 N. Michigan Avenue Chicago

Please send details.

Name.....

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If You're Paid Less than \$7000 a YEAR

Get into FLORKRAFTSMANSHIP



Remarkable New Profession—over 1300 Popular Mechanics Readers now earn \$25 to \$75 a day. Make This Your Regular Pay

SINCE we've told Popular Mechanics Readers of Clarke FlorKraftsmanship, over 1300 men like you have entered this big pay work. Are they skilled mechanics and carpenters? No. Just men like you, some low paid shop workers, some young fellows just out of school, some carpenters, some men fifty or sixty.

\$25 to \$75 a day—\$5,000 to \$10,000 a year—can be yours. It's inside work, finishing floors in new and old houses the amazing Clarke Vacuum Portable Sander way. Weather can't hold up your jobs. Neither can Winter. You get steady work—work almost as easy as running a vacuum cleaner.

What FlorKraftsmen Say

If you don't think there's money in Clarke FlorKraftsmanship, ask any man now in it. Read here what a few of these write us:

"My machine is working wonderful and I keep it busy most all the time. Please rush this order for sandpaper as fast as you can.—A. E. Sweeney, Alturas, California." "Getting along fine and plenty of work. Sure am well satisfied with the Sander and the work it does.—Jesse A. Miller, Maquoketa, Iowa."

"I have operated your Sanding Machine for the first time today, and found it satisfactory in every way. I was very glad to see that its advantages were according to your statements."

"Today was a real holiday for me, because operating your Sanding Machine was a real treat. It did three days work and gave me eight hours of enjoyment. I only regret that I haven't purchased this machine of wonders sooner.—Alphonse Renaud, Dover, N. H."

"The machine is a fine piece of mechanism and is very satisfactory to me.—S. J. Breckler, Columbus, O."

CLARKE SANDING MACHINE CO.

Dept. T-26, 3831 Cortland St.
CHICAGO, ILL.

Originators, and, for 12 years,
Manufacturers of Portable
Sanding Machines.

"I received the sanding machine in good shape. Have been sanding the floors in my house. It sure does good work.—H. B. Potter, Carthage, S. D."

"I am getting good results out of my machine. Would not want to be without it any more.—H. W. Gernert, Fullerton, Pa."

"The machine is a little wonder. Am well pleased with it.—J. S. Zirkle, Newell, W. Va."

Big Salary Increases

So many write us about their new independence—the new car they have bought or the better house they now live in—that we can't tell you all about it in this brief ad.

But the same opportunity is open to you. Become a FlorKraftsman and earn this big pay yourself. You need only about \$100 to start. No office or shop required. The Clarke and some sandpaper puts you in FlorKraftsmanship.

Figure Your Earnings

The Clarke sands 800 to 2000 square feet of new floor in 8 hours. Pay is 3 to 5 cents per foot. That's \$25 a day. Old varnished floors are sanded at the rate of 300 to 1000 sq. ft. a day, and the pay here is 7 to 15 cents a foot. The Clarke runs off a light socket. You carry it around by hand. No cost for trucking, because it weighs only 31 pounds complete. An hour teaches you to use it.

You want to make money? Then sit down and fill out this coupon, as these other readers have, and mail it direct to Clarke, the largest producer of sanders in the country. The full facts will reach you at once. No cost. No obligation. Mail coupon NOW.

MAIL THIS

Special Reader's Coupon free information

CLARKE SANDING MACHINE CO.,
Dept. T-26, 3831 Cortland St., Chicago, Ill.
Gentlemen: Please tell me, without obligation, how I can make \$25 to \$75 a day as a FlorKraftsman.

Name.....

Address.....

City.....State.....

They Have Succeeded— You Can Do As Well

W. G. Roe, Clarke FlorKraftsman, Richmond Hill, L. I., N. Y.—"My Clarke is my 'Lindy'—he sure can fly over the work, in fact, I have made money; I have made from \$40.00 to \$45.00 per eight hours with it. I would never be without a Clarke, and with more work I will soon have two."

Chas. T. Rose, Dixon, Calif.—"Recently my Clarke sanded and finished 4500 square feet of maple floor in 3 1/2 days—or 26 hours, and turned out the best job I have ever seen after a sander."

H. O. James, Mt. Sterling, Ky.—"I have already taken in \$348.00 for work and have 1,100 feet of old floors to do yet and some new ones too."



THE CROSLLEY AC LINE for 1929!

Thru the use of the superior Mershon condenser Crosley has developed electric light socket operation to a high degree of excellence and presents the trade with a line of AC sets for 1929 that set entirely new standards of radio performance!

AC Electric 7-tube Gembox operating dynamic powerspeaker

This amazing receiver contains the latest and best radio refinements—new neutrodyne circuit—3 stages of radio amplification—detector—2 stages of audio—171-A power tube in last audio stage—full voltage on plates of output tube—power supply self-contained—illuminated dial—beautiful case black crackled finish highlighted with white gold. Price without tubes \$65

CROSLLEY

ANNOUNCES THE GREATEST RADIO VALUE EVER OFFERED!

The AC Electric 7-tube **GEMBOX** (Without Tubes) **\$65**

New Full Neutrodyne circuit—New Chassis—New Volume control of exceptional smoothness—New Switch on front of case—New Added stage of radio frequency amplification—New 3 tuning condensers—New Elimination of regeneration in the detector tube

—combined with these modern, superior Crosley features so essential to complete radio satisfaction—

Proven Illuminated dial
Proven Self contained power supply

Proven Mershon condenser
Proven AC Electric socket operation

7-tube { 3 radio amplification tubes
1 detector tube
Radio { 2 audio tubes
1 rectifier tube

RADIO

THE CROSLLEY RADIO CORPORATION

Powel Crosley, Jr., Pres.

Department 15, Cincinnati, Ohio

Owners of WLW — the Nation's Station



The Crosley Dynamic DYNA-CONE—A power speaker of entirely different principle of operation producing all tones over the entire scale in true relation to each other—\$25

The 7-tube AC GEMCHEST

A cabinet of Chinese Chippendale design with new 7-tube GEMBOX and Dynacone built in—optional in 3 colors, red—green or black with metal trimmings—\$94



The Crosley Console DYNA-CONE—Console cabinets equipped with Crosley DYNA-CONES offer amazing value to the trade.

Crosley 8-tube AC Electric Showbox

This remarkable set, unusually selective, contains 3 stages of radio amplification, detector, 3 stages of audio with two 171-A power tubes in the last stage, rectifier tube—8 tubes in all. There is a full 180 volts on the plates of the last tubes which insures clear, rich volume of reproduction. The set is sharp, sensitive, powerful. Case is finished in black crackled effect highlighted with white gold. Price without tubes \$80

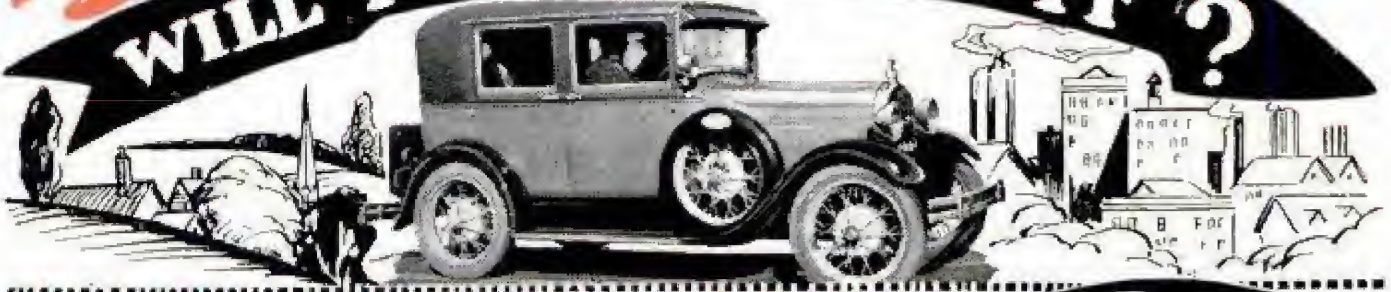


Crosley 8-tube AC Electric Jewelbox with tuned antenna circuit and power detector

A new powerful receiver employing a tuned antenna circuit, power detector tubes and use UY 227 tubes in all circuits except last audio stage and rectifier. The set contains a new and improved audio system with push-pull amplification and two 171-A power tubes in the last stage. This set is truly called "The World's Finest Receiver." Its selectivity and sensitivity are amazing. Combined with the dynamic Crosley DYNA-CONE performance is assured equal to the finest radio reception money can buy. The case is finished in black and highlighted with white gold or rich brown with yellow gold high lighting. All the improved Crosley features such as illuminated dial, Mershon Condenser, complete chidline, self contained power supply unit are incorporated in this wonderful value. Price without tubes \$105. Montana, Wyoming, Colorado, New Mexico and West prices slightly higher.

42 Miles on 1 Gallon of GAS

WILL YOUR CAR DO IT?



New Moisture Humidifier & Carbon Eliminator

for all Makes of Cars, Trucks, Tractors and Engines

An amazing Scientific Humidifier has been patented throughout the World that beats any ever got out. It makes engines run ALL THE TIME with the same wonderful efficiency they do on a cool moist night. It gives MORE pep and power, HIGHER top speed, eliminates hard carbon, and gives AMAZING mileage. Fords report 28 to 42 miles per gallon. Other makes (both American and Foreign) report marvelous increases of $\frac{1}{4}$ to double mileage. Some of the best records are:

Miles	Miles	Miles	Miles
Buick.....28 $\frac{1}{2}$	Ford (Model T) 42	Oakland.....31	Pierce Arrow.....22
Cadillac.....21 $\frac{1}{2}$	Ford (Model A) 40	Oldsmobile.....34 $\frac{1}{2}$	Pontiac.....31
Chevrolet.....41	Hudson.....23 $\frac{1}{2}$	Overland.....41	Reo.....26 $\frac{1}{2}$
Chrysler.....30 $\frac{1}{2}$	Hupmobile.....24 $\frac{1}{2}$	Packard.....21 $\frac{1}{2}$	Star.....41 $\frac{1}{2}$
Dodge.....31 $\frac{1}{2}$	Marmon.....21 $\frac{1}{2}$	Plymouth.....29	Studebaker.....29
Essex.....32	Nash.....30	Graham-Paige 23 $\frac{1}{2}$	Willis-Knight 29

And Hundreds of Other Wonderful Records on ALL American and Foreign Makes

Big Profits to

Man with Car Spare or Full Time

\$350 to \$1500 a month

1 man \$4,939.66 in 3 $\frac{1}{2}$ months
Another \$1,656.60 in 58 days
\$5,150.00 in 5 months to another. BIG MONEY can be—IS being made

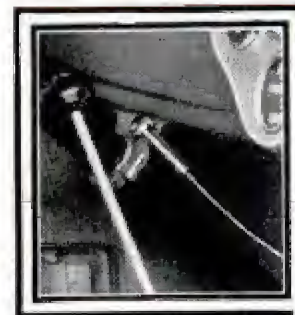
Fitting Motors With Vix

One man sold 8 first morning
Another sells all 3 men can install

Another's profits as high as \$100.00 a day

Vix sells itself by 8 STARTLING demonstration—B I G . . . STUNNING. ASTOUNDING DEMONSTRATIONS. Successful VIX men make MORE MONEY than they ever made before.

Free Trial TRY This New Principle Gas Saver AT MY RISK



Pictures here and at top show Model "B" VIX attached to my own New Model A Ford. This car is wonderfully improved in performance with the VIX Moisture Humidifier. So is every Auto, Truck, Tractor, Taxi, Bus, Marine, Stationary and Aircraft Engine, both American and all Foreign makes.

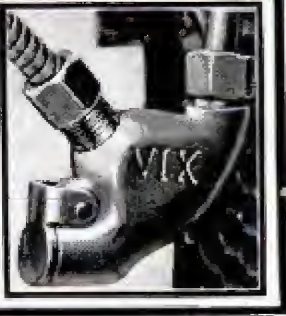
Try this wonderful VIX Moisture Humidifier and Carbon Eliminator AT MY RISK on YOUR OWN CAR to prove that VAPOR MOISTURE (drawn from Radiator to Engine) gives you that wonderful night driving effect ALL THE TIME with MORE mileage from gas and oil—eliminates hard carbon accumulation—gives MORE power, a SNAPPY, PEPPY motor, FASTER acceleration, a SMOOTHER, QUIETER running engine and HIGHER top speed.

VIX will PROVE ITS MONEY SAVING MERIT on your own car by 8 DEMONSTRATIONS—conducted by yourself AT MY RISK—the most SENSATIONAL, most ASTOUNDING, most CONVINCING DEMONSTRATIONS you ever saw. If you don't find from your tests that it does MORE than I claim; return it and it COSTS YOU NOTHING. I want wide-awake hustling, County, State, Province and National Agencies everywhere, part or full time, to make \$350 to \$1500 per month filling the great DEMAND for this wonderful invention wherever introduced. Write for my FREE TRIAL and MONEY MAKING OFFER. Use coupon below.

WALTER CRITCHLOW

Inventor and Manufacturer, 4P-805 Street, WHEATON, ILL., U. S. A.

FREE VIX offer Mail Now



WALTER CRITCHLOW, INVENTOR and MANUFACTURER, 4P-805 Street, Wheaton, Ill., U. S. A.

Please send me without obligation or charge your FREE TRIAL and MONEY MAKING VIX OFFER.

Name.....
Address.....
Town.....State.....

GUARANTEED TO SAVE { 1 4 to 1 2 Gas Carbon Cleaning Engine Repairs } or Costs You Nothing

FORD
40 Miles on
a Gallon

BUICK
36 Miles on
a Gallon

OLDSMOBILE
1300 Miles of
Free Gasoline

CHEVROLET
43.8 Miles Per
Gallon

STUDEBAKER
32 Miles on
Gallon

SAVED \$340
in Gasoline

OAKLAND
30 Miles Per
Gallon

REDUCES CARBON
Without Touching
the Engine

Who Else Wants to Save Gasoline?

FORD

"I have used one on my Ford for over five years and have traveled over 35,000 miles. Never had any spark plug trouble. Have averaged 28 to 30 miles on a gallon."

J. H. Alruth, Iowa.

CHEVROLET

"You people claim a saving of 25% and more. I found I was obtaining 43.8 miles to a gallon on a Chevrolet. Actual test surpasses your claim."

M. E. Miller, Kansas City.

BUICK

G. M. Rathburn, Charleston, W. Va., has a Buick Six. Having an old engine, he was getting only 8 or 9 miles to a gal. On a 287 mile trip he got 19 miles to a gal. He says it has saved him \$40.00 on one trip.

NASH

"I had a large Nash Six. I drove from Los Angeles to San Francisco on 20 gals. of gas. Vaporizer paid for itself the first trip."

H. T. McCallon, California.

A SOUTH DAKOTA man has discovered an amazing gas-saving invention now installed on over three million cars of every make. Already over ten thousand car owners say it increases gas mileage and saves an astonishing amount of money in gasoline and repair expense. There is a model for every car, truck, tractor or gasoline engine. Anybody can install it in a few minutes.

This invention is based on newly-discovered facts about potential gasoline power that few car owners know about. For example, it is now found that the average man wastes at least 20% to

30% of his gasoline through improper combustion. And many more interesting discoveries, too detailed to mention here.

Read on the left what other car owners say about it. Then accept the inventor's special introductory offer. He will send you samples to test without obligation to buy. If you find it doesn't do for you what it has done for other car owners, he will pay a cash forfeit for the few minutes you've spent in testing it. Don't send a penny now. Simply send your name in coupon below. J. A. Stransky Mfg. Co., G-10 Stransky Block, Pukwana, S. D.

J. A. STRANSKY MFG. CO.,
G-10 Stransky Block, Pukwana, S. D.

Yes, send me full description of this new way to save gasoline. This request does not obligate me in any way.

My name is.....

Street.....

City.....State.....

() Check here if you want agent's proposition.

Men Wanted Herrick made \$157 in a day, letting Stransky vaporizers sell themselves. Territories open everywhere. Full or spare time. Check coupon at right.